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ABSTRACT

This handbook has been structured to provide teachers (K-2) with the most recent research on problem solving. It contains information and practical applications which deal with the key concepts of problem solving in mathematics. The handbook consists of four sections. The first section establishes the background and gives the purposes of the handbook. The second section provides a general overview of problem solving. It identifies two types of problems and presents the stages of thinking when solving a problem. This section also describes the key problem solving strategies which are commonly used in the primary grades. The third section includes the main body of the handbook containing a variety of activities for each grade level. Charts interface the activities with mathematical topics and problem solving strategies for each grade level. The last section contains a bibliography of 18 items which can be used as supplementary resources. (MVL)

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curriculum support series

problem solving handbook for grades k—2 mathematics

province of manitoba
department of education 1983

PROBLEM SOLVING HANDBOOK

FOR

GRADE K - 2 MATHEMATICS

1983

PROVINCE OF MANITOBA

DEPARTMENT OF EDUCATION

ISBN 0-7711-0142-2

FOREWORD

This handbook has been structured specifically to provide the teachers (K-2) with the most recent research on problem solving. It contains information and practical applications which deal with the key concepts of problem solving in mathematics.

The handbook consists of the following four sections:

The first section establishes the background and states the purposes of the handbook.

The second section provides a general overview of problem solving. It identifies two types of problems, and it presents the stages of thinking when solving a problem. More importantly, this section identifies and describes, with examples, the key problem solving strategies which are commonly used in the primary grades.

The third section includes a series of carefully selected problem activities for each grade. These activities have been structured to interface the regular mathematics program.

The last section contains a bibliography of materials which can be procured and used as supplementary resources.

ACKNOWLEDGEMENTS

The Department of Education acknowledges with appreciation the contribution of all people who assisted in the production of the Problem Solving Handbook.

Committee Members

Linda Burnell - Fleming School, Brandon
Betty Johns - University of Manitoba, Winnipeg
Glenn Matsumoto - Bertrun E. Glavin School, Winnipeg
Shirley Maurice - Ryerson School, Winnipeg
Pat Tennyson - R.H.G. Bonnycastle School, Winnipeg
Cecile Ungrin - University of Manitoba, Winnipeg
Linda Walker - Emerson School, Winnipeg
Bob Watson - Lakewood School, Winnipeg
Bob McIntosh - Department of Education, Winnipeg
Peter M. Luba, Chairperson - Department of Education, Winnipeg

Reviewers

Susan Blair - Dalhousie School, Winnipeg
Pam Buhr - Oakbank Elementary, Oakbank
Marlene Campbell - Waterhen School, Waterhen
Anne Crockatt - R.H.G. Bonnycastle School, Winnipeg
Phyllis Crosson - McAuley School, McAuley
Shirley Cummins - Riverheights School, Brandon
Mary Lou Driedger - Elmdale School, Steinbach
Mary Dushenko - Maple Leaf School, Morden
Mary Peterson - Greenway School, Winnipeg
Gail Surman - Strathmillan School, Winnipeg
Andrea Sweetland - Victory School, Winnipeg

INTRODUCTION

The 1978 Curriculum Guide has as its main objective, the meaningful development of mathematical concepts and skills. Special emphasis is placed on the development of problem solving.

The National Council of Teachers of Mathematics in their "Agenda for Action" brought to the attention of all educators, the need for improving problem solving in the eighties. Consequently, in 1980 the Manitoba Association of Mathematics Teachers and the Department of Education sponsored jointly a seminar on problem solving, which was attended by teachers representing the school divisions in Manitoba. Following the seminar, locally planned in-services on problem solving were conducted in more than 40 school divisions with support from the Department of Education. Teachers who attended the in-service expressed a need for more help in the teaching of problem solving.

This handbook is designed to provide guidance and give direction for Kindergarten to Grade Two teachers in their approach to help children with problem solving. Its content complements and supports the Manitoba Curriculum Guide.

SPECIFIC OBJECTIVES

The specific objectives of the handbook are:

- to establish a better awareness of the meaning of problem solving,
- to develop an awareness of various problem solving strategies,
- to provide a collection of activities which relate to problem solving,
- to promote the development of an atmosphere which facilitates inquiry,
- to use problem solving as a bridging component among various strands of mathematics and other areas of learning,
- to devleop an awareness of skills which are needed to solve problems through active involvement,
- to promote and maintain a positive attitude toward problem solving.

HOW TO USE THE HANDBOOK

The four sections of the handbook have been designed for teacher information and for classroom use.

The introductory section describes the purposes of the handbook. These purposes are useful to teachers in establishing effective goals for a problem solving program.

The overview provides teachers with background information which identifies problem types and problem solving strategies. The problem solving examples illustrate how strategies are used to solve problems.

The main body of this handbook contains a variety of activities for each grade level. It is suggested that as a mathematical topic is taught, teachers select those activities which are relevant to the topic. The selection is facilitated by referring to the introduction page in the Kindergarten section and the curriculum charts in grades 1 and 2. The charts interface the activities with mathematical topics and problem solving strategies.

Teachers should review the bibliography and endeavour to obtain resources for review purposes and classroom use, wherever possible.

TABLE OF CONTENTS

1. Foreword iii

2. How to Use the Handbook ix

3. Introduction vii

4. Specific Objectives vii

5. Overview of Problem Solving 3

    What is a Problem 3

    Types of Problems 3

    Stages of Thinking 5

    Problem Solving Strategies 7

6. Problem Activities .....

    Kindergarten 21

    Grade 1 Problem Activities 39

    Grade 2 Problem Activities 67

7. Bibliography 114

OVERVIEW OF PROBLEM SOLVING

OVERVIEW OF PROBLEM SOLVING

WHAT IS A PROBLEM?

A problem is a situation in which a person wants something and needs to experience one or more actions in order to get it.

Four elements are involved in the definition of a mathematical problem:

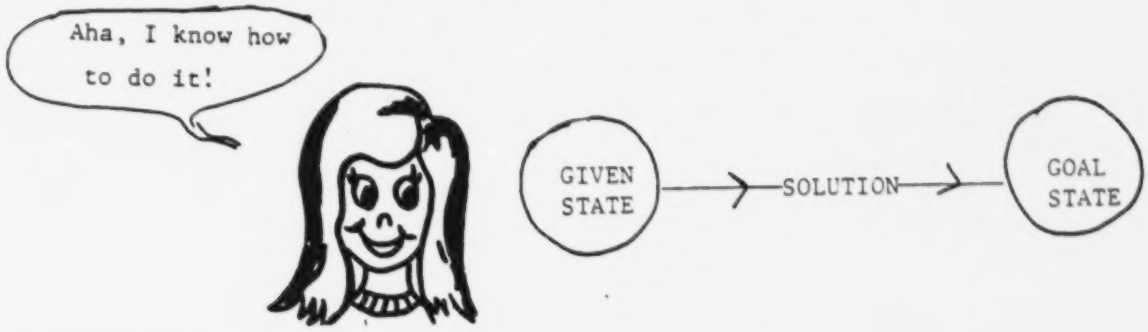
1. The situation must involve mathematics
2. the situation must exist involving an initial state and a goal state
3. a solution must be desired
4. there must be some blockage between the given and desired states.

TYPES OF PROBLEMS

There are two types of problems:

Type 1

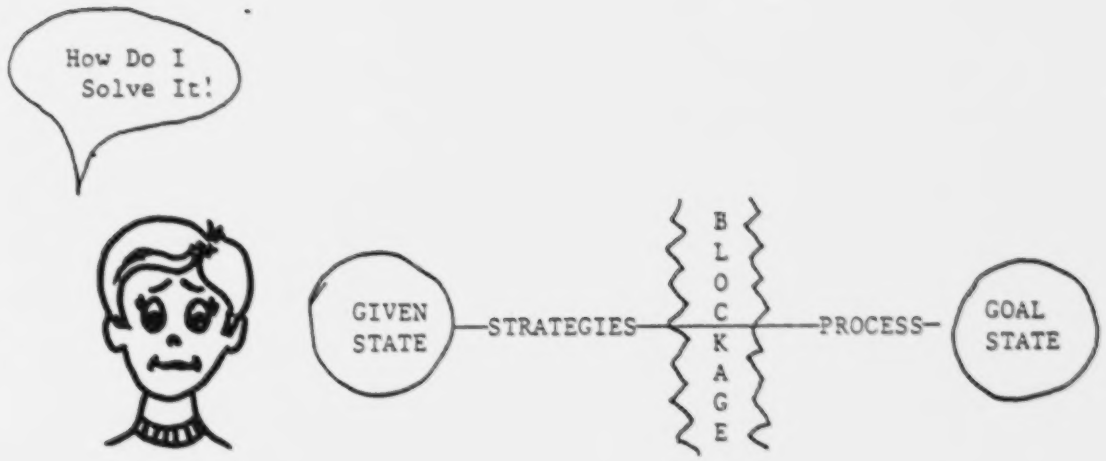
In the first type, the solution to the problem appears to be quite obvious. Known procedures are used to solve the problem.



Many problems included in K-2 materials are Type 1. They are generally story problems. It is not too surprising that many of the problem activities center around Type 1 since they are designed to develop basic thinking skills.

Type 2

In the second type, an individual is confronted with a problem where the solution is not obvious and the individual is not aware of a standard procedure to solve the problem. In other words, there is a blockage between the given and goal state. In this situation the individual must apply one or more strategies in order to identify with a workable procedure.



One should not get caught in the apparent dichotomy of Type 1 versus Type 2 problems, for this division is not a distinctive feature of problem solving at the K-2 levels. Both are important and have their place in various problem solving situations.

The development of problem solving proficiency is continuous and sequential. Kindergarten to grade two children, should begin to acquire this proficiency through consistently engaging in problem solving experiences.

STAGES OF THINKING

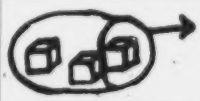
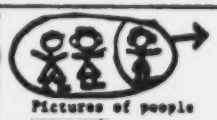
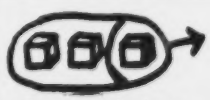
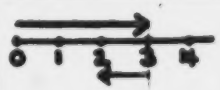
(As They Relate To Problem Solving)

The stages of thinking are listed in the chart below and are generally accepted as the series of stages through which students progress as they grow and develop in their problem solving skills.

A problem is used to illustrate in chart form, a series of experiences through which a student may pass to reach the final stage of thinking in arriving at the solution.

PROBLEM: Three children are playing in the yard, Mother called one of the children into the house. How many are left in the yard?

A problem is perceived.

Stages of Thinking	Teaching Methods	Levels of Conceptulization
Concrete	Real objects are manipulated to arrive at solutions.	The problem is acted out using real people
Concrete	Nonrepresentational concrete objects are manipulated to arrive at solutions.	 People represented by actual blocks.
Semi-Concrete	Pictures of real objects are used in arriving at solutions.	 Pictures of people are used.
Semi-Concrete	Drawings of nonrepresentational objects are used in arriving at solutions.	 Pictures of blocks which represent people are used.
Semi-Abstract	A graphical model is constructed	
Abstract	A mathematical model is constructed to represent the structure of the relationship	3 - 1 = 3 - 1 = n Number sentence is written.
Abstract	Algorithms and mathematical processes are applied.	3 -1 2 Problem solved by subtraction.

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PROBLEM SOLVING STAGES

1. Understanding
2. Planning
3. Carrying Out
4. Looking Back

UNDERSTANDING relates to being able to listen and/or read with meaning.

PLANNING means to be able to determine the strategy or strategies.

CARRYING OUT means to be able to utilize the strategy or strategies.

LOOKING BACK means to be able to check the solution.

PROBLEM SOLVING STRATEGIES

Strategies are techniques for solving widely dissimilar problems of varying degrees of difficulty. They include procedures that can be used to make a problem clear, simple and manageable.

Four characteristics of a strategy approach to problem solving are:

- strategies are skills that can be learned
- strategies may be used in a variety of problems
- a variety of strategies may be used to solve a single problem
- strategies may be used singly or in combinations to solve a single problem.

In general, strategies give the individual the tools which are necessary to solve problems. Many students unconsciously use strategies when solving problems. However, they will develop better problem solving skills by becoming more aware of the specific strategies. As students develop these skills progressively, they will, in the process, develop analytical thinking skills.

The strategies commonly used in primary grades are:

Guess and Check
Classify
Look for a Pattern
Act It Out
Diagram (draw, graph)
Write a Number Sentence

On pages 8 - 13, each strategy is described and sample problem activities are given which require the use of the strategy to solve the problem.

STRATEGY: GUESS AND CHECK

A guess and check strategy requires a child's careful attention to the pertinent information of the problem but not necessarily in a formal manner. Its application results in an answer, which is expected to be close to the solution.

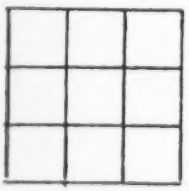
The next step in the process is to check the guessed answer against the problem conditions to determine if it is reasonable.

If the guessed answer is not reasonable, the process is repeated until the correct solution is obtained.

Example 1

Problem:

Place the numbers 1 to 9 into the squares of the grid below so that the sum of the three numbers in any direction (horizontal, vertical, diagonal) equals 15.



Solution:

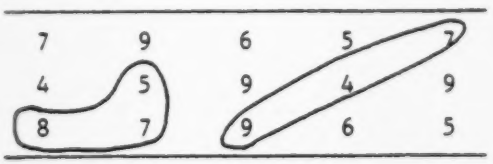
4	9	2
3	5	7
8	1	6

Other solutions are possible.

Example 2

Problem:

Draw a line or make a loop around any set of three adjoining numbers which add up to 20.



Other solutions are possible.

STRATEGY: CLASSIFY

Classifying may be defined as putting objects, numbers or ideas, into groups according to specified characteristics. Classification involves comparison for differences and similarities.

Classification not only leads to development of sound number concepts but also develops essential skills for organizing one's environment.

Example 1

Problem:

A child is given a set of objects and is asked to pick those of a given colour.

Solution:

From a set of objects of different colours, select those of a given colour. The child classifies the objects and then describes the classification.

Example 2

Problem:

Classify the following numbers into two groups,

12, 5, 14, 28, 7, 35, 98, 73, 24

Solution:

The child tries to make two groups (eg. classifying). After completion the child shows and explains the classification.

Suggested groups are: odd and even, one digit and two digit, less than 20, greater than 20, and others.

STRATEGY: LOOK FOR A PATTERN

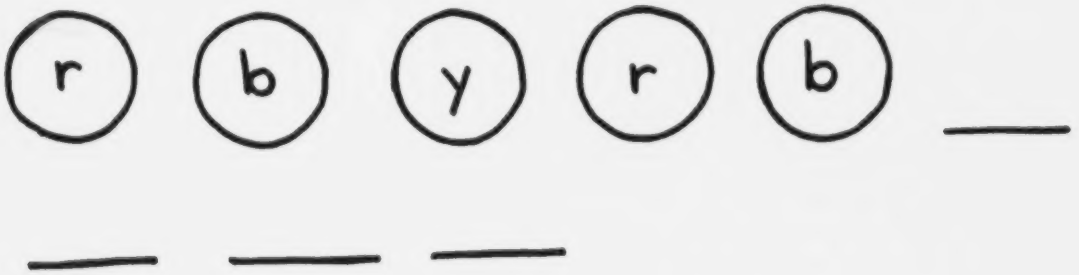
Looking for a pattern involves examining a series of shapes, colours or combinations of a set to ascertain if a pattern is present and if it repeats itself.

Example 1

Problem:

Continue the pattern.

Example:



Problem:

Continue the pattern.

STRATEGY: ACT IT OUT

Acting it out involves going through actions which give the problem a "concreteness". This concreteness makes it easier to discover relationships leading to a solution.

Example 1

Problem:

Mother has 24 wrapped candies. To how many children can Mother give 3 candies each?

Solution:

Have children act out the solution.

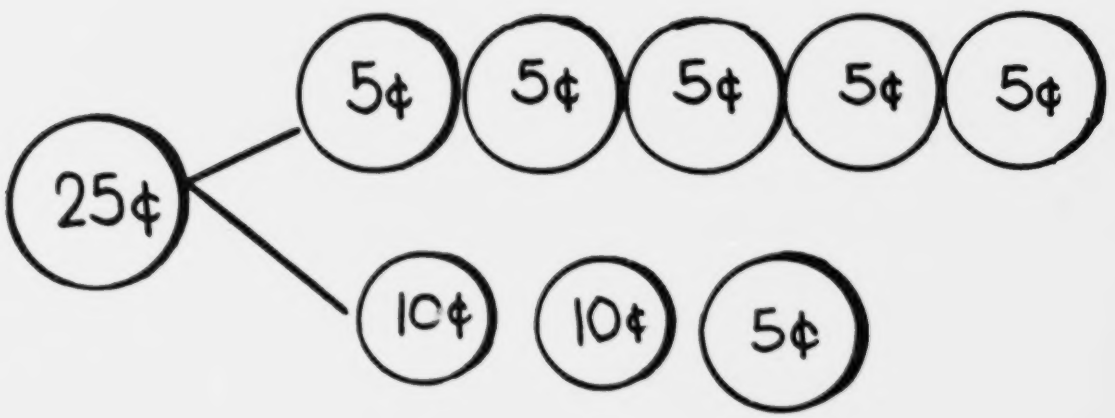
Example 2

Problem:

How can you make change for 25¢ using five coins? three coins?

Solution:

Have children use coins.



STRATEGY: DIAGRAM (DRAW, GRAPH)

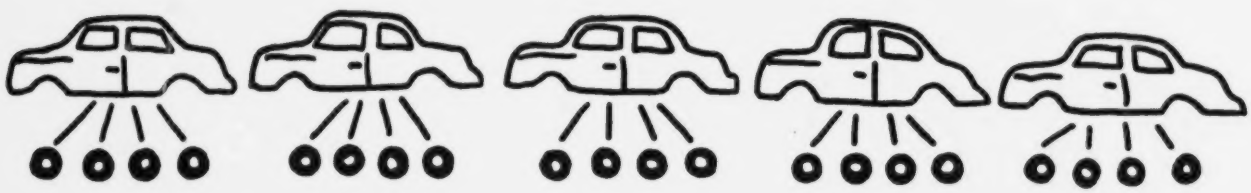
This strategy is the depicting of given information in a diagram, drawing or graph. The diagram, drawing or graph illustrates a connection between pieces of given information, which will lead to the solution.

Example 1

Problem:

There are five cars. Each car needs all new tires. How many new tires are required?

Solution:



Example 2

Problem:

A blue card is 4 cm wide and 9 cm long.
A red card is 6 cm wide and 8 cm long.

Which one of the two cards has the longest distance around it?

Solution:

Have children draw the cards and then measure the distances using a string or a ruler.

STRATEGY: WRITE A NUMBER SENTENCE

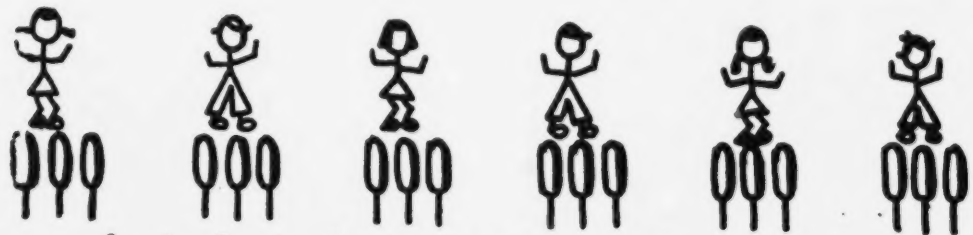
A number sentence is usually arrived at after one or more strategies have been applied. The problem data then is used to set up a number sentence.

Example 1

Problem:

There are six children. If each child gets three popsicles, how many popsicles are needed?

Solution:



3 + 3 + 3 + 3 + 3 + 3 = ( )

OR

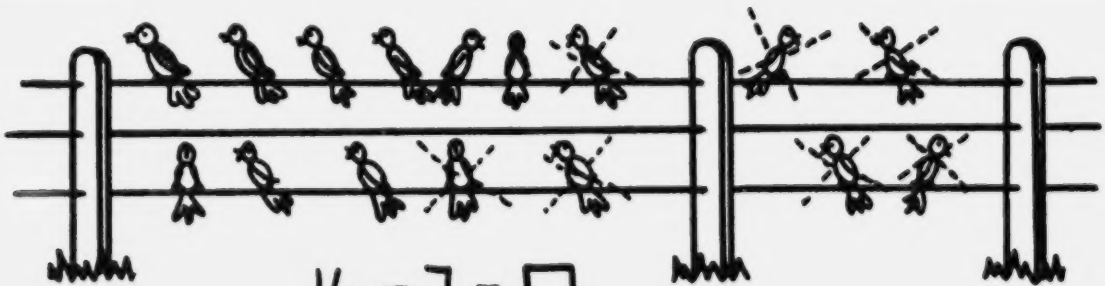
6 x 3 = □

Example 2

Problem:

Sixteen birds are sitting on a fence. If seven of them fly away, how many are still on the fence.

Solution:



16 - 7 = □

SUGGESTIONS FOR INITIATING PROBLEM SOLVING EXPERIENCES

Page 71, K-6 Mathematics Teacher's notes:

"Problem situations should arise every day. They should be oral in nature and lend themselves to easy interpretation by the use of manipulative material. Oral interaction at this point is extremely important. Such questions as: "What did you have to begin with?"; "Then what happened?"; "What did you do?"; "What have you now?"; all help the child to understand the operation involved in the problem."

I. Everyday Problems

A. Fall

a. Happenings over the summer such as lost teeth, holiday trips, company, moving, going to camp, having a birthday, welcoming a new baby.

b. The number of days in September, the children in the room, members of families, rooms in the school, cars in the parking lot, buses that bring children to school.

c. Collections of seeds, weeds, flowers, fruit and vegetables.

B. Winter

a. Sledding, skating, hockey, indoor activities.

b. Kinds of clothes worn now.

C. Spring

a. Marbles, soccer, baseball, biking, skipping.

D. Summer

Planting gardens, planning a trip, picking flowers.

II. "Special Days" Problems

A. Birthdays, School events (teas, centennials, science fairs, hot dog days, 4-H fairs, field days, run-a-thons).

B. Holidays

a. Thanksgiving

b. Hallowe'en

c. Christmas

d. St. Valentine's Day

e. St. Patrick's Day

f. April Fool's Day

g. Easter

SUGGESTIONS (cont'd)

B. Holidays (continued)

h. Mother's Day

i. Father's Day

j. Canada Day

III. Field Trips

A. Planetarium

B. Museum

C. Park or Farm

D. Zoo

E. City

IV. Other Subject Areas

A. Language Arts

B. Social Studies

C. Science

D. Health

E. Gym and Music

USE OF ATTRIBUTE BLOCKS

Preparation:

Sets of attribute pieces may be made from coloured bristle board, if commercial sets are not available.

A set of attribute pieces should contain:

Four (4) large triangles; red, green, blue, yellow.
Four (4) small triangles; red, green, blue, yellow.
Four (4) large squares; red, green, blue, yellow.
Four (4) small squares; red, green, blue, yellow.
Four (4) large circles; red, green, blue, yellow.
Four (4) small circles; red, green, blue, yellow.
Four (4) large rectangles; red, green, blue, yellow.
Four (4) small rectangles; red, green, blue, yellow.

A set of "clue"cards may be constructed. (See p.18)

Hula hoops, rope "surrounds", or string will be needed for some activities.

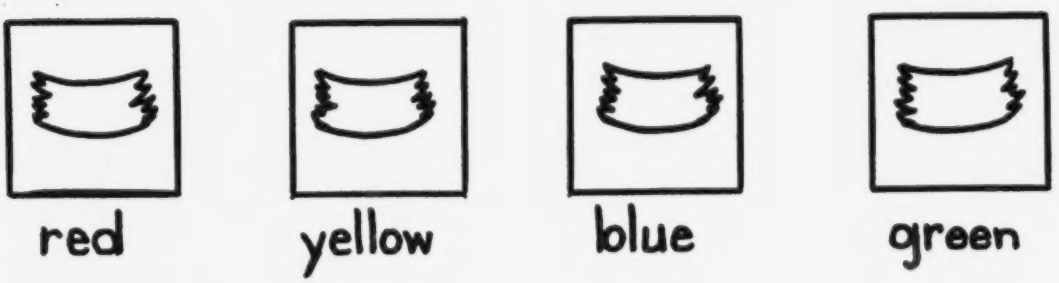
Procedure:

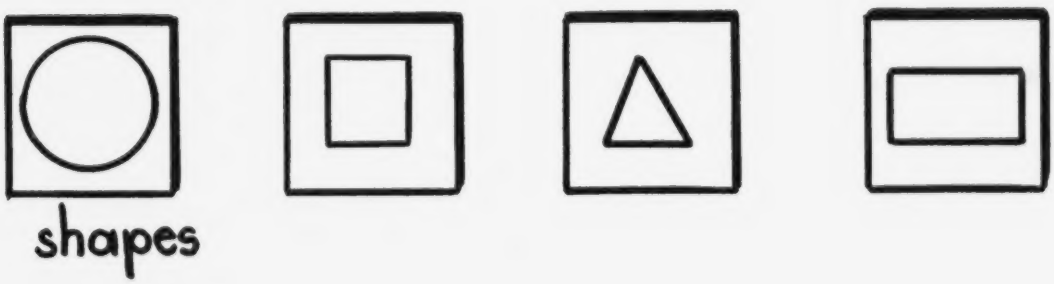
Free Play

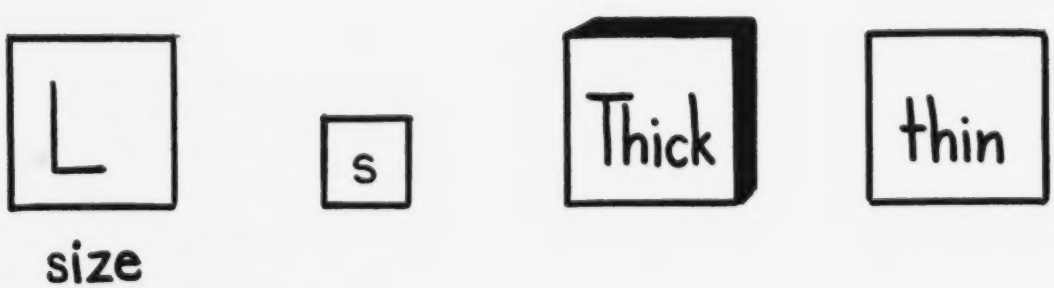
Children should be allowed sufficient time to become familiar with the material. They should be encouraged to name, identify, describe and compare the pieces.

To achieve above objective, many activities will be required over a period of time.

Clue Cards: (Commercial sets have 3 colours).
These cards may be used with "teacher-made" sets as clues for identifying attribute pieces. (Use 13 cm by 9 cm cards for large groups and 5 cm by 5 cm for individual or small group use.)







KINDERGARTEN ACTIVITIES

INTRODUCTION TO KINDERGARTEN ACTIVITIES

This section deals with a series of activities designed to support the development of problem-solving skills.

Problem-solving at the kindergarten level is considered as a special program in that there are no formal "problems" in evidence and there is no formal problem solving.

At this level many of the introductory skills in problem-solving, such as classifying, comparing, acting out, and others, are initiated and gradually developed. The skills are best developed for children when they evolve around activities using well selected concrete materials and are related to interesting and motivating experiences. Through these activities children learn to examine, observe, compare, describe and make decisions. These skills are later translated to problem solving strategies.

The activities in the kindergarten section are designed to be used in conjunction with the Manitoba Kindergarten Curriculum. They can be integrated with relative ease into the total program.

A curriculum chart, similar to those in grades 1 and 2, is not included in the kindergarten section because the activities constitute a readiness program for problem solving and, as such, are dependent to a large degree on the instructional approach in the classroom.

INTRODUCTORY EXPERIENCES LEADING TO ACTIVITIES INVOLVING THE USE OF ATTRIBUTE PIECES

Before proceeding with activities using attribute pieces, it is essential that children develop the ability to describe objects from their environment. The experiences should be multi-sensory, where objects are examined and "talked about" as to their use, size, texture, shape, colour and other characteristics. They are then compared for similarities and differences and sorted accordingly. Language, relative to the children's experiences is developed through active participation.

In providing these activities, the children are guided in becoming quite flexible in their reasons for classifying. These experiences will serve as a basis for the more structured activities using attribute pieces.
NOTE: See the K-6 Mathematics Curriculum, p. 41.

Example:

Materials: Nails (different sizes) , pencils, spools, erasers, straws, paper cups, elbow macaroni, spaghetti, potatoes, crayons, small containers such as those from margarine, yogurt or sour cream, bottle caps, empty cans such as those from drinks and vegetables and toy dishes.

Experience:

- Each child selects one object, examines and describes it. (All answers are accepted.)
- Children discuss likenesses and differences. Which two objects belong together? Why? (e.g. straw and nail)
- Find one more object to go with the straw and nail. (e.g. pencil) Why?
- Choose another object (e.g. potato) Could this object go with the other three choices? Why not?

Following many of these experiences, proceed to the directed oral activities found in the K-6 Mathematics curriculum guide pp. 42 & 43.

Alternatively, the activities involving the attribute pieces can replaced with materials within the children's environment. Collections of different types of containers, lids from containers, buttons, seeds, stones, pencils, pieces of string or ribbon, leaves, and so forth can be used in place of the attribute pieces. Children can classify these collections of objects using the same attributes described in the following activities. For example, the children can be asked to find all the lids which differ in size, shape, or colour. Similarily the children can be asked to continue a pattern comprised of a large lid, a small lid, a small lid, a large lid, a small lid, and a small lid.

These collections of objects can also be used to introduce other attributes such as length, width, or texture. For example instead of having the children classify the lids according to size, shape, or colour, one can ask them to classify the lids according to the type of edge (straight or curved) or the type of material (cardboard or metal).

Many of the above activities work better in small group situations. It is suggested that while one group is working on the introductory activity, the other children can be involved in alternative activities such as:

painting
block building
doll house
puppet theatre
puzzles, cut-out, colouring or
book browzing

ACTIVITY SHEET K.01

Classify: (General)

Materials: A variety of objects such as pencils, buttons, crayons, boxes, cans, stones, leaves and others that are found in the children's environment. Hula hoops or pieces of long string.

Preparation: Place all objects in the centre of the table.

Procedure:

1. Have children identify each object and describe at least two of its characteristics.
2. Tell the children that you will be placing the objects into two sets and they must guess the rule you are using to determine in which set an object belongs. For example, the objects may be classified according to the following characteristics:
    a. long or not long
    b. hard or not hard
    c. things with which we write
    d. things with which we can't write
    e. small or not small, and so forth.

Variations:

1. Change the objects with new additions
2. Change the number of sets to three or more.

ACTIVITY SHEET K.02

Classify: (Similarities)

Materials: Attribute pieces (see pp. 17, 18), three or more sets, if available, hula hoops or rope loops.

Preparation: A large area, table or floor with the attribute pieces placed in the middle. Children around the material.

Procedure:

1. Select one of the pieces, for example, the small blue square.

   Ask the children to find all the pieces which:

   a. have the same shape and place them in the hoop or loop,

   b. are the same size and place them in a second hoop or loop, and

   c. are the same colour as the piece shown and place them in a third hoop or loop.

   Note: If only one set of attribute pieces is available, after a. and before beginning b, have the children return all the pieces to the centre. Follow the same procedure after b, and before beginning c.

2. Repeat the activity, each time using a different piece until the children can classify the pieces with relative ease.

ACTIVITY SHEET K.03

Classify: (Differences)

Materials: Attribute pieces (see pp. 16, 17), three or more sets, if available, hula hoops or rope loops.

Preparation: A large area, table or floor with the attribute pieces placed in the middle. Children seated around the material.

Procedure:

1. Select one of the pieces, for example, the large red triangle.

   Ask the children to find all the pieces which are:

   a. different in shape and place them in the hoop or loop,

   b. different in size and place them in the hoop or loop,

   c. different in colour as the piece shown and place them in a hoop or loop.

   Note: If only one set of attribute pieces is available, after a. and before beginning b, have the children return all the pieces to the centre. Follow the same procedure after b, before beginning c.

2. Repeat the activity, using a different piece each time, until the children can classify the pieces with relative ease.

Variations:

1. Ask the children to group all the pieces which are:

   a. not large (encourage discussion)

   b. not square

   c. not red

   Follow the procedure as shown in #1 and #2.

ACTIVITY SHEET K.04

Classify: Equivalent Sets

Materials: Counters such as blocks, unifix cubes, beads or bingo chips. Two paper pie plates per child.

Preparation: Small group setting for 6 to 8 children at a time.
Stack the pie plates.
Place the counting materials in the centre of a table or on the floor so that the children may be within easy reach and may clearly observe the demonstration by the teacher.

Procedure:

1. The teacher places two paper pie plates in front of each child with 7 counters on one plate and 3 counters on the other plate. The teacher invites suggestions to have each plate contain the same number of counters. Follow through each child's suggestion and discuss.
2. Each child may now take 2 paper pie plates from the stack. The teacher places a different number of counters on each child's plate.
3. The children rearrange the objects so that each paper pie plate contains the same number of counters. Verify each child's activity and discuss.

Variations:

1. Change the number of blocks for each child.
2. Change the number of pie plates.

ACTIVITY SHEET K.05

Guess

Materials: 5 different objects, for example, a bell, a ball, a marble, a block, and a crayon.

Preparation: Small group setting of 6 to 8 children at a time.

Procedure:

1. Line up objects. Make sure the objects are placed where the children can see them.
2. Tell the children that you are thinking of one of the objects and that you will give them clues to help guess which object it is.
3. Give the children 3 clues such as: it's round, it's hard and it's shiny. What is it?
4. Have the children verify each guess by repeating the clues which were given.

ACTIVITY SHEET K.06

Guess and Check

Materials: A small cloth drawstring bag, a golf ball, a bubblegum, a coloured cube, a pencil, a comb and a bead.

Preparation: Small group setting of 6 to 8 children at a time.

Procedure:

1. Teacher lets each child handle the bag containing a variety of objects. Guesses are made as to what each object may be. The bag is passed around a second time for a second guess. Discussion is encouraged.
2. Each child now places her/his hand in the bag and without removing the object touched, describes what it feels like and what it might possibly be.
3. Each child touches, describes, makes an identification of the object and draws it out for verification by other children.

ACTIVITY SHEET K.07

Making Guesses

Materials: A paper bag, 3 red cubes and 1 white cube

Preparation: Small group setting of 4 to 6 children

Procedure:

1. Without showing the children what you are doing, place the 4 cubes in the bag.
2. Show the children the bag and tell them they must guess whether there are more red cubes or white cubes in the bag.
3. Pass the bag to one of the children in the group. Instruct the child to reach into the bag without looking and to draw out one cube. Have the child return the cube to the bag after the children have had an opportunity to see it.
4. Continue to pass the bag around until all the children have had an opportunity to draw out a cube or until they think they know whether there are more red cubes or white cubes.
5. Ask the children whether there are more red cubes or white cubes and why they think so. Have the children verify their guess by checking the contents of the bag.

Variations:

1. Change the number and composition of the cubes in the bag. eg. Place 6 red cubes and 3 white cubes in the bag. Place 4 blue cubes, 2 white cubes, and 2 red cubes in the bag.

ACTIVITY SHEET K.03

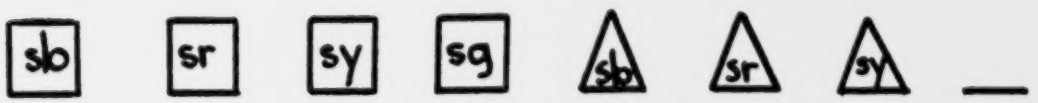
Patterns

Materials: Attribute pieces, 3 or more (see p.17 and 18).

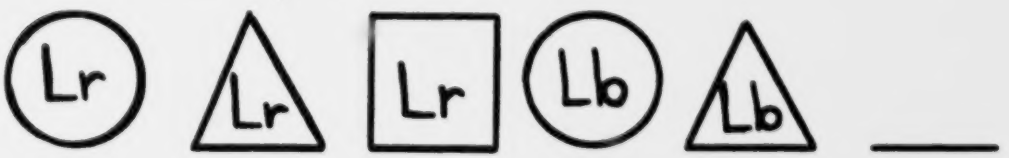
Procedure:

1. Note: s = small b = blue g = green
   r = red y = yellow L = Large

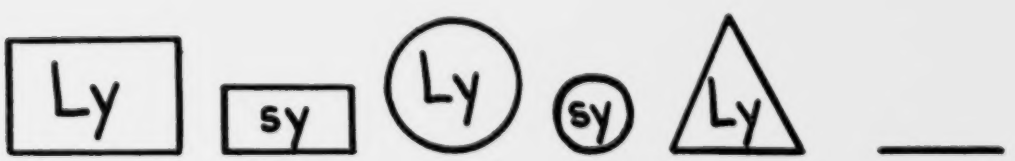
   Have each child make the following pattern with the pieces.



1. Ask the children which piece is next. If children experience difficulty in identifying the next piece, point to the first 2 blocks in the pattern and ask how they are alike, and how they are different. Point to the second and third blocks and ask how they are alike and how they are different. Continue questioning in this fashion until the children recognize the pattern.
2. Have each child make the following pattern with the pieces. Ask which piece will come next.



3. Have each child make the following pattern with the pieces. Ask which piece will come next.



ACTIVITY SHEET K.09

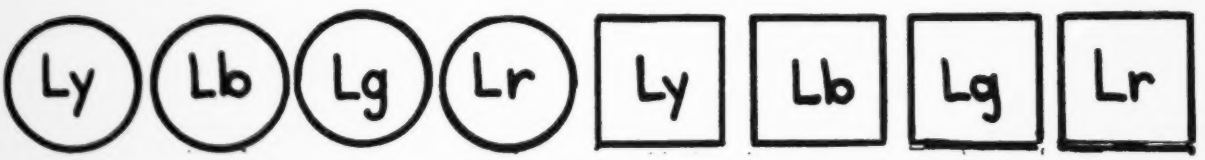
Patterns

Materials: Attribute pieces (see pp. 17, 18)

Preparation: Small group of 6 to 8 children at a time.

Procedure:

1. Have each child make the following pattern with the blocks



2. Tell the children to shut their eyes. While their eyes are closed, remove a piece from each child's pattern. Tell the children to open their eyes, and have each child identify which piece is missing from the pattern. Once a child has identified a piece, ask her/him to place the piece in the open space and determine if it is correct.
3. Repeat the above procedure several times, each time using a different pattern.

Note: If only one classroom set of attribute pieces is available, the procedure will have to be changed.

1. The teacher makes the pattern for the group to see.
2. The children shut their eyes, while the teacher removes one piece from the pattern. Tell the children to open their eyes. Select one child to tell which is the missing piece and let him/her place it in the open space. Discuss and verify with other children.
3. Repeat the above procedure several times, using different patterns.

Variation:

1. Repeat the above procedure, using the following patterns.

a.

b.

ACTIVITY SHEET K.10

Patterns

Materials: attribute pieces (see pp. 17, 18)

Preparation: Small group of 6 to 8 children at a time.

Procedure:

1. Show the children the following pattern:

After the children have had an opportunity to study the above pattern, ask them to close their eyes. While the children's eyes are shut, remove one of the pieces. Tell the children to open their eyes, then ask them to identify the missing piece. Ask the children why they think the piece they have identified is the missing one. Place the piece the children have identified into the pattern and help them determine whether their guess was right or wrong. If the children have difficulty identifying the missing piece point to different rows and columns and ask the children how the blocks are alike and how they are different. Continue questioning in this fashion until the children recognize the pattern and can identify the missing piece.

2. Repeat the above procedure several times, each time using a different pattern. For example:

ACTIVITY SHEET K.11

Equivalent Trains

Materials: Red construction paper; blue construction paper; centimetre ruler; and scissors.

Preparations:

1. Make a set of ten red pieces of construction paper. Each piece should be 2 cm wide. The lengths of the pieces should be 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 cm respectively.
2. Make an identical set of blue pieces of construction paper.
3. Make as many sets of red and blue pieces as you want.

Procedures:

1. Provide each child with a set of red and a set of blue pieces of construction paper.
2. Ask the children to put one red piece and one blue piece together (i.e. lay the piece end-to-end) to make a red-blue train. Instruct the children to make other red-blue trains the same length as the original train.
3. Ask the children to try to make red-blue trains all the same length using all the red and blue pieces.

ACTIVITY SHEET K.12

Ordering Objects

Materials: Three objects of varied length, for example, three strips of paper: 10 cm, 20 cm, and 30 cm in length respectively.

Procedure:

1. Arrange the objects in order from the shortest to the longest. After the objects are arranged, show them to the children. Ask the children to guess how the order of the objects was established.
2. Place two of the three objects, for example, the shortest and longest in front of the children. Show them the remaining object and ask them where this object should be placed and why. That is, have the children identify whether the remaining object should come at the beginning, in the middle, or at the end of the given arrangement of objects.

Variations:

1. Change the number of objects.
2. Arrange the objects in descending order, i.e. order the objects from longest to shortest.
3. Arrange dissimilar objects, such as pencil, ruler, and piece of string, in order from shortest to longest.
4. Order objects according to a different attribute such as height, size (big-little), thickness (fat-thin) using plastic containers from yogurt, sour cream, margarine, ice-cream, and others.

ACTIVITY SHEET K.13

Stacking Cubes

Materials: Coloured cubes such as unifix cubes, small paper plates, or half sheets of construction paper or the lids of margarine containers.

Preparation: Place a row of 4 paper plates on a table. Stack 6 cubes on the first plate; 3 cubes on the second plate; 2 cubes on the third plate; and 5 cubes on the fourth plate.

Procedure:

1. Tell the children that each stack of cubes represents a building. Ask the children how the buildings are alike and how they are different.
2. Instruct the children to rearrange the cubes so that each building is the same height.

Variations:

1. Change the number of cubes in each stack, for example, stacking 8 cubes on the first plate, 2 cubes on the second, 2 cubes on the third, and 4 cubes on the fourth.
2. Give the children 16 cubes and several plates and ask them to make as many buildings as they can that have the same height.
3. Change the total number of cubes. For example, arrange twenty cubes into four stacks that differ in height.

ACTIVITY SHEET K.14

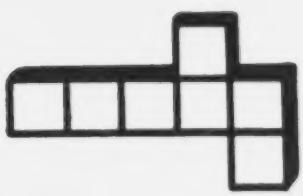
Building Shapes

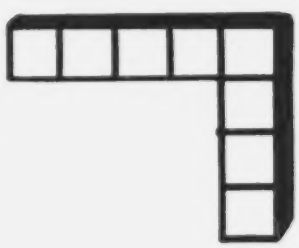
Materials: Coloured cubes

Procedures:

1. Give each child seven coloured cubes.
2. Instruct the children to make as many different shapes as they can using all seven cubes.

e.g.





3. After the children have had an opportunity to manipulate the cubes, have each child make one shape using all of the cubes. Once the shapes are completed, have the children discuss the shapes and sort them according to a characteristic. For example, children could sort the shapes into groups according to shape, colour, or height.

Variations:

1. Change the number of cubes given to each child.
2. Change the rules e.g., All the shapes must form an "L".

ACTIVITY SHEET K.15

Packing

Materials: Six to ten boxes. The boxes should be selected in such a way that no two boxes are the same size and all the smaller boxes can be packed, one within the other into the largest box.

Procedure:

1. Show the children the boxes. Select one (shoe box) and ask the children to select a box that will fit into the shoe box. Let them verify whether the box will fit into the shoe box.
2. Ask the children to select a box that will hold the shoe box. Let them verify whether the box will hold the shoe box.
3. Repeat steps 1 and 2 several times, each time using different boxes, i.e., each time the teacher should select a different box then have the children select boxes that will either fit into or hold the teacher's box.
4. Ask the children to find the largest box.
5. Once the largest box is found, instruct the children to pack all the boxes into the largest box in such a way that the lid to the largest box can be shut.
6. Encourage the children to find other ways of fitting the smaller boxes into the larger box.

Variations:

1. Change the number of boxes that have to be packed.
2. Change the type of containers that are to be packed. e.g., instead of packing boxes, have children pack containers with curved edges such as margarine tubs, juice, and vegetable cans.

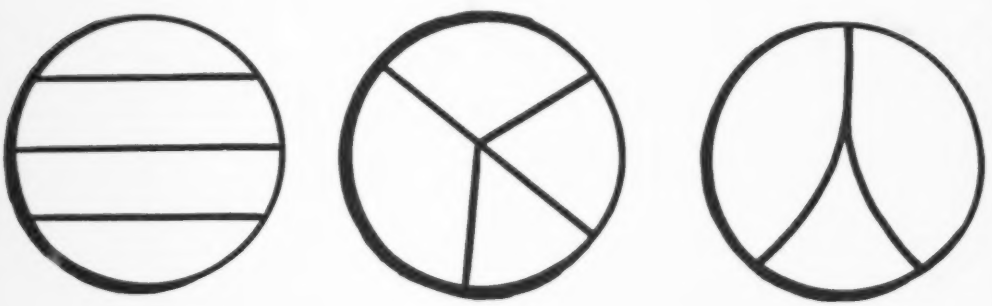
ACTIVITY SHEET K.16

Circular Puzzles

Materials: Different coloured bristol board, scissors, compass and envelopes.

Preparation:

1. Construct several circles each having a diameter of 20 cm. Use a different colour for each circle.
2. Cut each circle into three or four parts and place the pieces into an envelope. Draw a circle on the front of each envelope to show that the pieces inside form a circle.



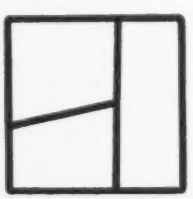
Procedure:

1. Let each child select an envelope. Instruct the children to use the pieces inside to form a shape like the one shown on the envelope.

Variations:

1. Use a shape other than circles such as:

A square



A triangle

PROBLEM SOLVING ACTIVITIES GRADE I

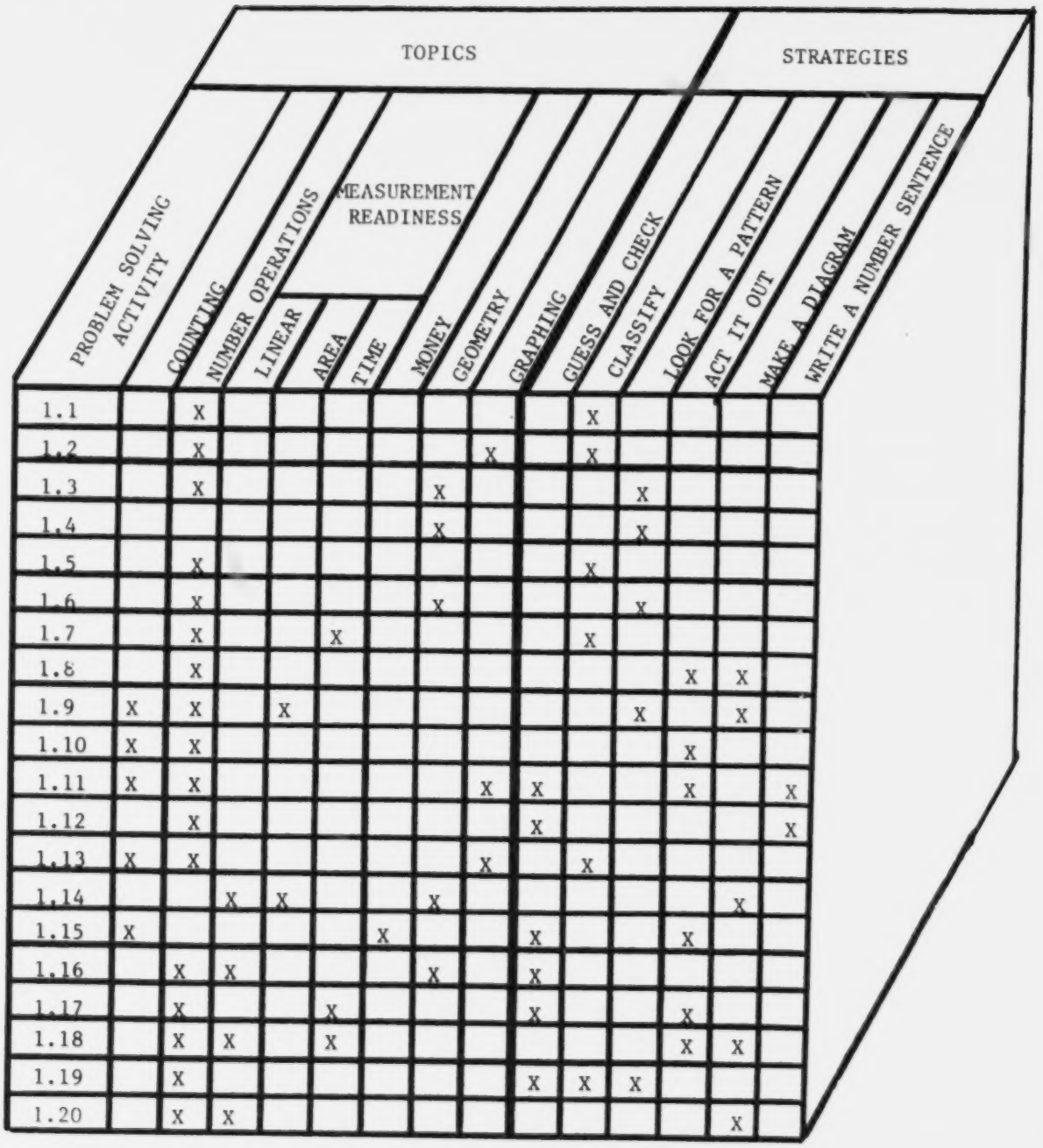
Note to Teachers

Re: Activities Using Attribute Pieces

Although many children may have experienced some of these activities in Kindergarten, they will benefit by doing them again as a review and reinforcement.

CURRICULUM CHART

YEAR 1



PROBLEM SOLVING ACTIVITY 1.01

Strategy: Classify

Topic: Number

Materials: Collections of bottle caps and bottle tops, graph paper and masking tape.

Activity: Make a collection of bottle caps and bottle tops and bring them to school.

What kinds of caps were brought to school and how many are there of each kind?

Procedure:

1. Discuss differences and similarities in the bottle caps, such as name and colour.
2. Sort the caps that belong together and discuss the reasons.
3. Place the caps in each category on strips of masking tape, sticky side up.
4. Verify the classifications with the children. Classify again if necessary.
5. How many caps are there in each row and how many are there in all?

Variation:

Use graph paper instead of sticky tape and colour in each square to represent a bottle cap or top.

PROBLEM SOLVING ACTIVITY 1.02

Strategy: Classify

Topic: Number

Materials: A collection of about 3 dozen buttons which children bring with permission from parents. A hula hoop, a large sheet of graph paper and gummed stickers.

Activity: Mr. Green, the storekeeper just received a shipment of buttons to sell in his store. There are many kinds of buttons, but they are all mixed together in one box. How will we help Mr. Green to arrange the buttons so that his customers will buy them?

Procedure:

1. Begin with discussions about buttons on the clothes of the children. What characteristics do buttons have? Encourage such observations as: large, small, colored, two-holed, glass and so forth.
2. Spread the collected buttons on a table or in a hula hoop on the floor. Recall some of the characteristics discussed earlier and have the children make some suggestions as to how they can help Mr. Green.
3. Have the children classify the buttons according to the characteristics which they have identified.

Variation:

Graph by placing the buttons in rows - discuss - then replace buttons with a sticker on the graph paper.

PROBLEM SOLVING ACTIVITY 1.03

Strategy: Pattern

Topic: Number

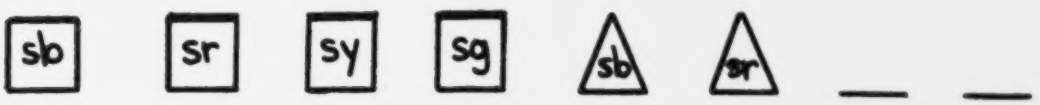
Materials: Attribute pieces, (see p. 16, 17). A set for each group of 6 to 8 children.

Activity: Look at different clothing worn by children (stripes, plaids, dots, floral) in the classroom, identify and describe the patterns. Have the children identify and describe other patterns seen in the classroom.

After discussion and sufficient experiences in identifying patterns, have the children form patterns using the attribute pieces.

Procedure:

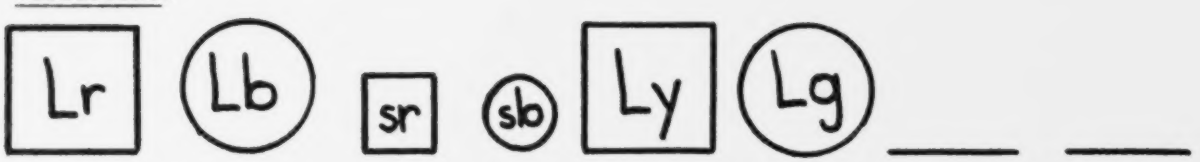
1. Have the children continue the sequence of attribute pieces.



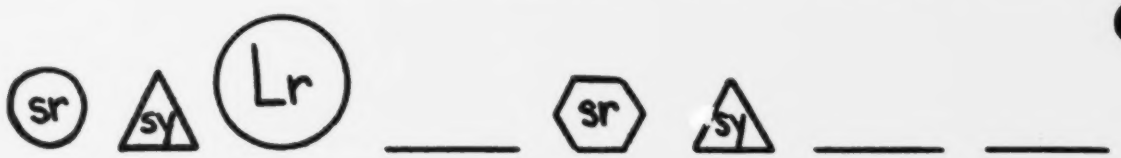
2. Continue the pattern.

Variations:

1.



2.



PROBLEM SOLVING ACTIVITY 1.04

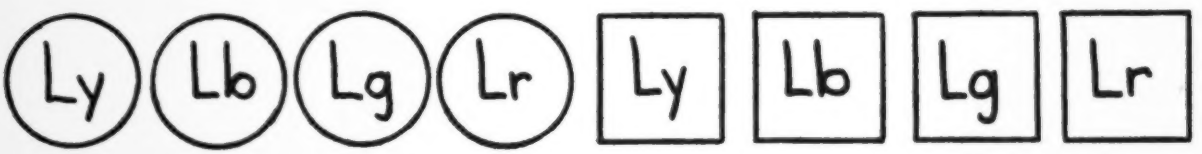
Strategy: Patterns

Topic: Geometry

Materials: Attribute pieces, (p. 16, 17) one set for each of 6 to 8 children.

Procedure:

1. Have the children make the following pattern with the attribute pieces.



2. Have the children shut their eyes. When their eyes are closed, remove a piece from each group's pattern. Tell the children to open their eyes and have them identify the piece which is missing from the pattern. Once the piece has been identified, ask her/him to place that piece in the open space and determine if it has been correctly placed.
3. Repeat the above procedure several times, each time removing a different piece from each pattern.

Note: If only 1 classroom set of pieces is available, the procedure will be as follows:

1. The teacher will make the pattern for the class to see.
2. The children will shut their eyes while the teacher removes 1 piece from the pattern. The children will open their eyes and identify the missing piece. Discuss and verify.

Variation:

Repeat the above procedure, using the following patterns:

a.

b.

PROBLEM SOLVING ACTIVITY 1.05

Strategy: Classify

Topic: Number

Materials: Attribute pieces, (see p. 16, 17) hula hoops or rope loops.

Preparation: A large area, table or floor with the attribute pieces placed in the middle. Have children seated around the material.

Procedure:

1. Select one of the pieces, for example, the large red triangle.
   Ask the children to find all the pieces which are:
   a. different in shape and place them in a hoop or loop,
   b. different in size and place them in a hoop or loop,
   c. different in colour and place them in a hoop or loop,
   d. different in shape and colour and place them in a hoop or loop.

Note: If only 1 set of attribute pieces is available, after a. and before b., have the children return all the pieces to the centre. Follow the same procedure after b. and before beginning c. and after c. and before beginning d.

2. Repeat the activity, using a different piece each time until the children can classify the pieces with relative ease.

Variations:

Ask the children to group all the pieces which are:

a. not large but yellow (encourage discussion)
b. not square but blue
c. not red but round

Follow the same procedure as #1 and #2 above.

PROBLEM SOLVING ACTIVITY 1.06

Strategy: Pattern

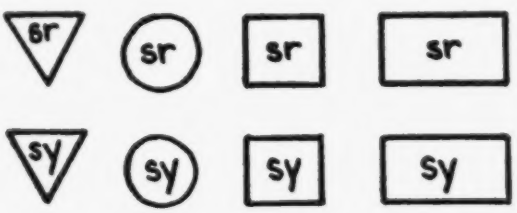
Topic: Number

Materials: Attribute pieces, (see p. 16, 17) a set for each group of 6 to 8 children, and an example of a block pattern from the children's environment.

Activity: As preparation for this activity, the teacher will have to get an article which displays a block pattern such as a tablecloth or quilt, or a wallpaper sample for examination and discussion. The children will have previously studied patterns which repeated in the left-to-right sequence. Here, they will look for sequence which repeat in rows and columns.

Procedure:

1. Show the children the following pattern: Study it carefully.



2. The children close their eyes while the teacher removes a piece from the pattern.
3. The children now identify the missing piece and replace it in the open space.
4. Give each member of the group a turn at removing a piece while the others in the group identify the missing piece.

Variations:

1. Make a pattern with 3 rows and 4 pieces in each row. Check across the row and down a column to prove the missing piece is the correct one.
2. Remove 2 pieces.
3. Remove an entire row.
4. Remove an entire column.

PROBLEM SOLVING ACTIVITY 1.07

Strategy: Classify

Topic: Number

Materials: Calendar (classroom constructed or commercial), the class register, twelve cut-out paper birthday cakes, labelled with the names of the months, pins, tape, felt pens, and a small paper "candle" for each child.

Activity: Special Days: Birthdays (see p. 14 Michael has a birthday this month. Last month Robyn and Ryan had a birthday. When is your birthday? In which month are there the most birthdays?

Procedure:

1. Check the birthdays of the children in the classroom using the class register and the information given by the children. Print the name of each child on a paper candle.
2. Place the twelve cut-out paper birthday cakes on the blackboard ledge in random order.
3. Have each child tape his/her candle on the appropriate cake.
4. Children then look for the month which has the most birthdays.

Variations:

1. Allow the children to arrange the months in correct order.
2. In which month are there fewest birthdays?
3. Are there any months in which no one has a birthday?
4. Has someone turned eight after December? seven? and how many children will be still 6 when school ends in June?
5. Allow the children to classify the cakes into two groups e.g. cakes with fewer than 4 candles, more than 4 candles.

PROBLEM SOLVING ACTIVITY 1.08

Strategy: Act it out and Make a diagram

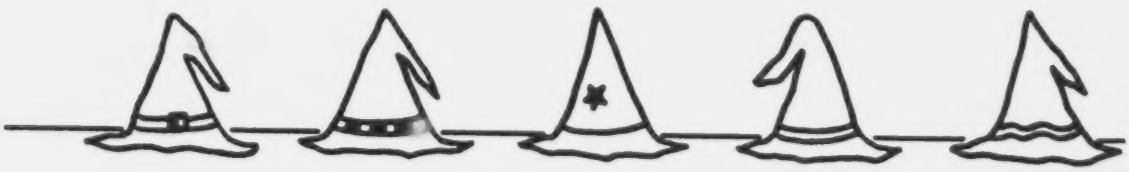
Topic: Number

Activity: This Hallow'en there were 5 witches in the Wild Woods. Two witches brought their brooms. The rest of the witches brought their cats. Are there more witches with cats or more witches with brooms?

Materials: Pencils, paper, crayons, 2 hula hoops or skipping ropes.

Procedure:

1. After discussion of the problem with the children, set aside a section of the room which will be the Wild Woods. Let the children suggest how to set up the activity.
2. Dramatize the activity. Discuss.
3. On paper, draw the 5 witches' hats, to represent the witches.

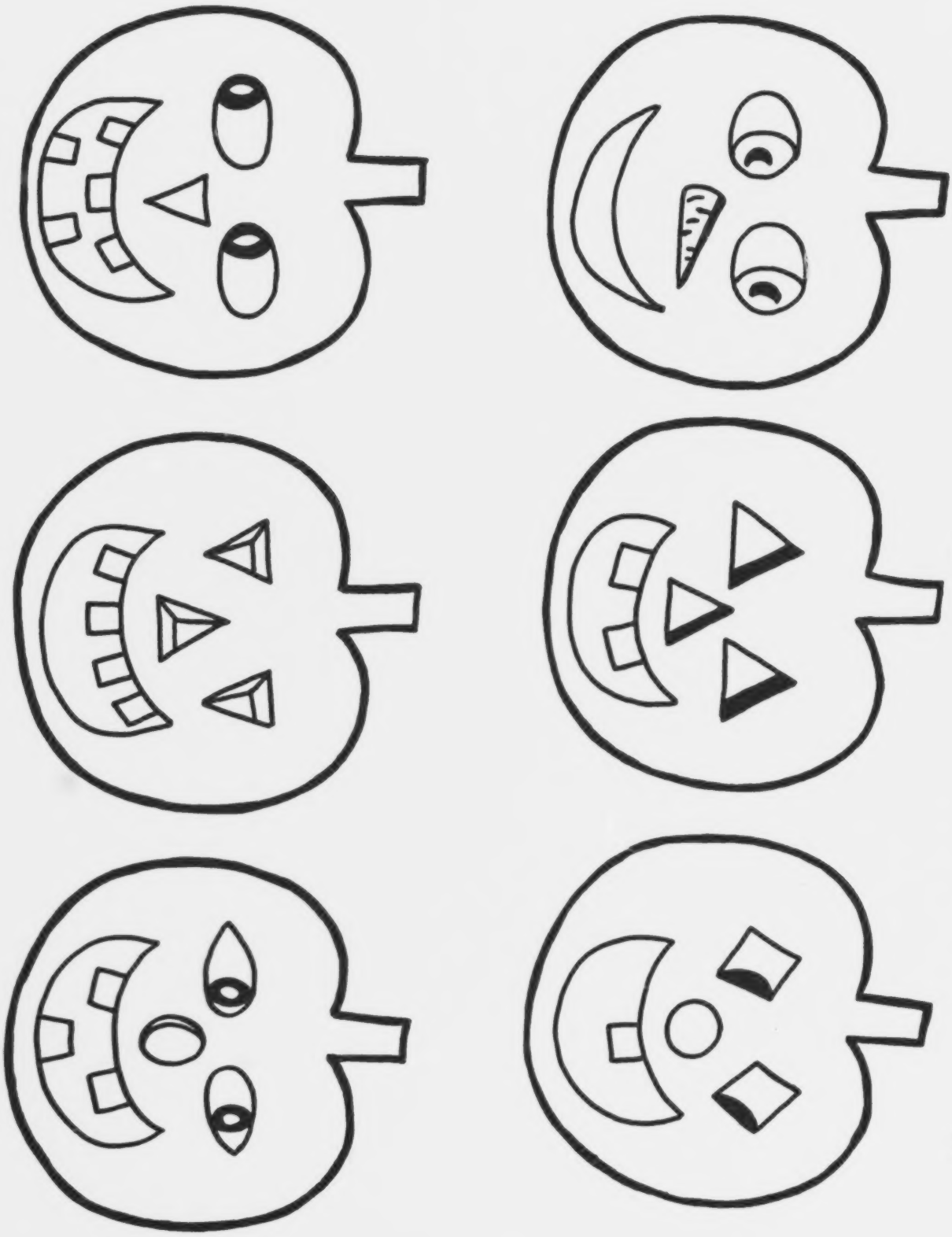


4. Make the brooms and the cats to correspond with the hats.

Variation:

1. Children may do similar problems with different numbers.
2. Use 5 pumpkins and cut 2 into jack-o-lanterns. How many more are there to cut?
3. Using the 5 jack-o-lanterns with sets of 0 to 5 teeth, cut and arrange them in order according to the number of teeth and then paste them. (See page 51.)

PROBLEM SOLVING ACTIVITY 1.08



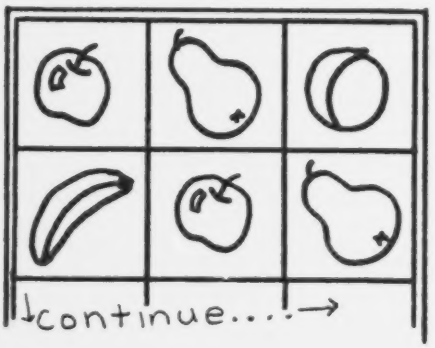
PROBLEM SOLVING ACTIVITY 1.09

Strategy: Make a Diagram and Look for a Pattern

Topic: Counting

Materials: Four cut-outs of each: apple, pear, peach and banana.
10 cm x 10 cm white paper per child
[illegible], glue, pencils, scissors
[illegible] coloured construction paper.

Activity: Laura's Mom begun to make a quilt for Laura's new bed. These pictures are the ones Laura chose. The quilt will have 3 pieces across and has 15 pieces in all.



What will Laura's quilt look like when it has been completed?

Procedure:

1. Trace the fruit cut-out on the 10 cm by 10 cm white paper, colour and cut out.
2. Let children arrange the fruit on the coloured sheets (quilt background) to match the example. Discuss the pattern.
3. Paste the fruit on the coloured sheets.
4. Discuss:
   a) how many pieces were used?
   b) how many pieces were left over?
   c) could you have made the quilt larger? How?

Variation:

Design a quilt with 3 friends using a theme about toys. Colouring books may give the children some ideas. Group decisions should be made on objects, size and colour.

PROBLEM SOLVING ACTIVITY 1.10

Strategy: Act It Out

Topic: Number

Materials: Crayons, scissors, coloured sheets of paper for each child, pictures of 2 clown faces, (see p. 49) three old hats (from New Year's Eve party, a garage sale and/or mother's cast offs) and two different coloured balloons.

Activity: How many different ways can clowns be fitted with hats?

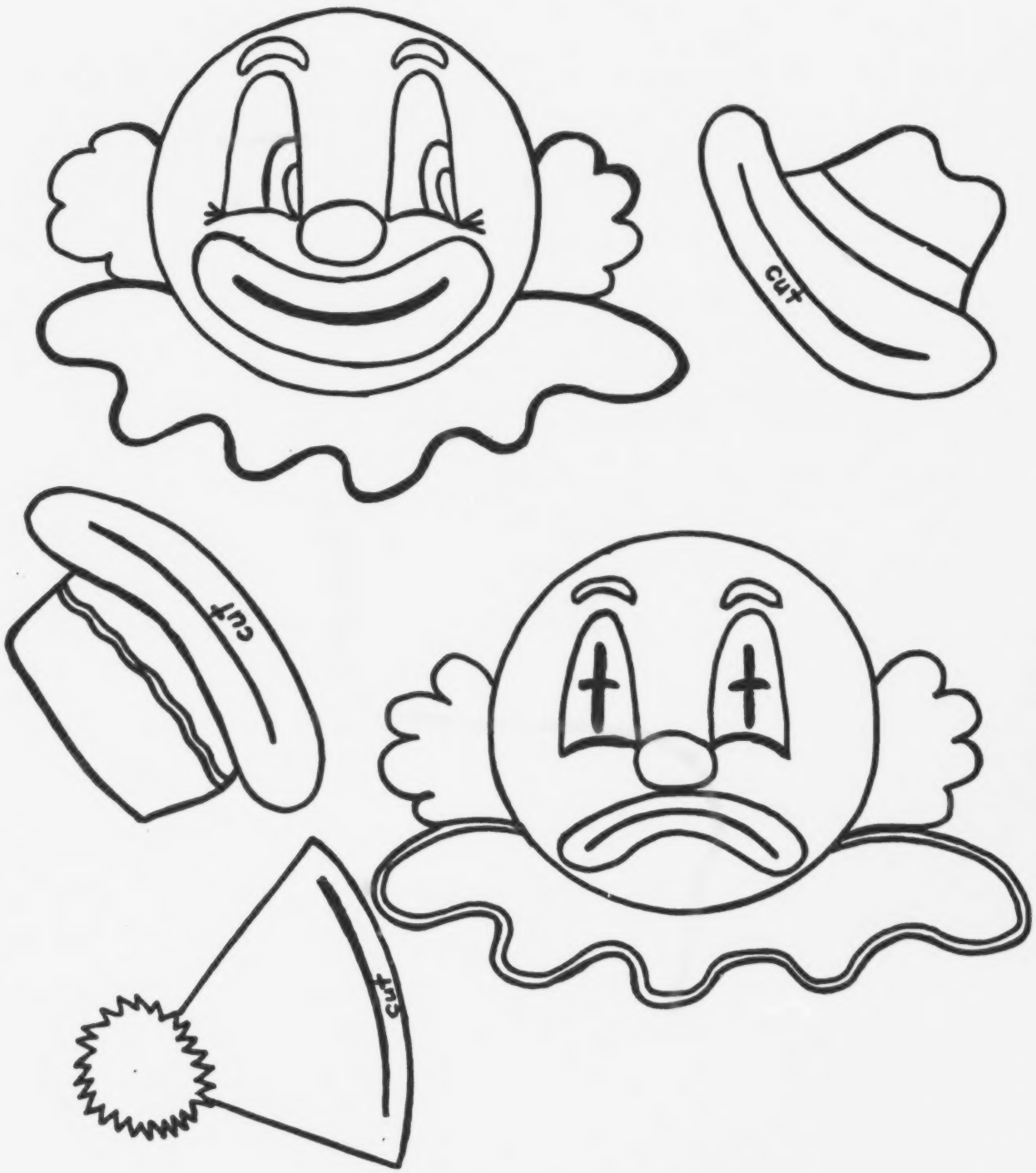
Procedure:

1. Ask 2 children to be helpers. Each holds a balloon as a head. Ink on the face on each balloon. Have children try on the different hats on the balloons. Allow sufficient time for discussion. How many different ways can clowns be fitted with hats?
2. Pass out the reproduced pictures of the 2 clowns and the 3 hats. (see the following page.)
3. Colour, cut out and glue the 2 clown faces on the coloured sheet. Cut out the clowns again to make it possible to try on the hats which are cut out as well.
4. Each time a different hat is tried on the clown record with a check (✓) or a numeral.

Variations:

1. In a large envelope, make another set of 2 clown faces with 4 hats, or 5 hats, and follow the same procedure as above.
2. Make 3 clown faces and try the 5 hats to see how many different clowns can be made.

PROBLEM SOLVING ACTIVITY 1.10

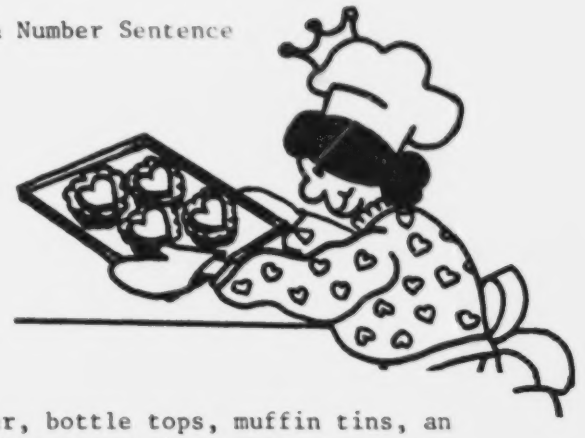


PROBLEM SOLVING ACTIVITY 1.11

Strategy: Guess and Check and Write a Number Sentence

Topic: Number

The Queen of Hearts
She made some tarts
All on a summer's day
The Knave of Hearts
He stole those tarts
And with them ran away.



Materials: Plasticene, pencil and paper, bottle tops, muffin tins, an empty egg carton, the blackboard and chart paper.

Activity: How many tarts could the Queen of Hearts have made if she made more than 8 but less than a dozen?

Procedure:

1. Discuss the variety of articles which are purchased by the dozen List them. The egg carton will help to establish the number of things which make a dozen.
2. Make plasticene "tarts", by cutting them out with bottle tops. Discuss the possible number of tarts the Queen could have made.
3. Record each suggestion and list the names of the children on the blackboard or chart paper as they make their guesses.
4. If plasticene is not available, use other suitable material.

Variations:

1. The nursery rhyme lends itself to dramatization. The children may manipulate the "taking away" of the tarts by the Knave. Discuss the answers, subtracting from 9, 10, 11.
2. Each child may now draw the number of tarts they have chosen. Make an X on each tart the Knave of Hearts has taken. Record the number sentences. Examples: 10 - 4 = __, 9 - 6 = __, 11 - 7 = __.
3. Discuss the kinds of muffin tins which may be purchased, e.g. 1 set of 6, 3 sets of 3 or 4 sets of 3. Draw the tin which would bake exactly 9 muffins. Which tin would be used to bake 10 muffins, 11 muffins? Draw them.

PROBLEM SOLVING ACTIVITY 1.12

Strategy: Guess and Check - Write A Number Sente

Topic: Number

Little Boy Blue
Come blow your horn
The sheep's in the meadow
The cow's in the corn
But where's the little boy
Who looks after the sheep
He's under the haystack
Fast asleep!

Materials: 9 unifix blocks for each child, paper, pencil, two paper plates or other containers.

Activity: In how many ways is it possible to have two groups of animals which total 9 on this farm?

Procedure:

1. Label the paper plates, SHEEP and COWS, and place the unifix blocks
2. Discuss the results. Accept all contributions.
3. Record the number sentences.
   Examples: 9 = 3 + 6, 4 + 5 = 9

Variation:

The farmer across the road has pigs, sheep and cows. In how many ways can the 3 sets be grouped to total 9 animals?

PROBLEM SOLVING ACTIVITY 1.13

Strategy: Classify

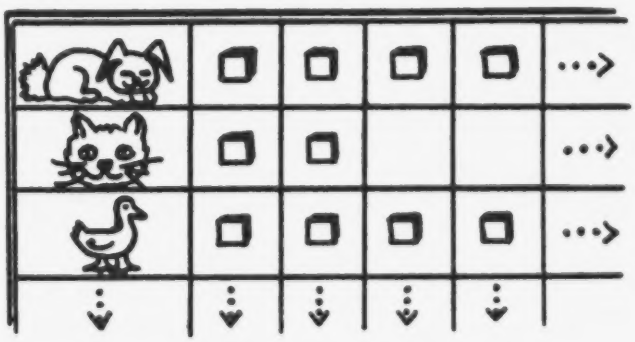
Topic: Graphing

Materials: Paper, pencil, crayons, graph paper, unifix blocks, stickers, plastic animals or any representative materials.

Activity: Mr. James is a helper at the zoo. This spring, 5 brown bunnies, 2 lion cubs, 4 yellow ducklings, 3 monkeys and 1 fox were born. In the farm section of the zoo, 5 black and white bunnies were born, 3 goslings, and 6 chicks were hatched and the brown cow had a calf. Mr. James wants to make sure all the newly born animals are placed with animals of their own kind. How can he do this? How could all the animals be grouped?

Procedure:

1. Allow children to arrange the animals in their own way. Discuss
2. How can Mr. James keep a record of all the newly born animals? Discuss.
3. To record the information, use the graph paper labelling each row with a picture of each category.
4. Place one piece of representative material in each square as the newly born are recorded.



5. Replace each piece of concrete materials by colouring each square. (semi-concrete graph).
6. Have the children interpret the graph.

Variations

1. How many creatures are there in each category.
2. How many are animals and how many are birds.
3. Are there more four-legged or winged creatures? How many more?

PROBLEM SOLVING ACTIVITY 1.14

Strategy: Make a Diagram

Topic: Geometry

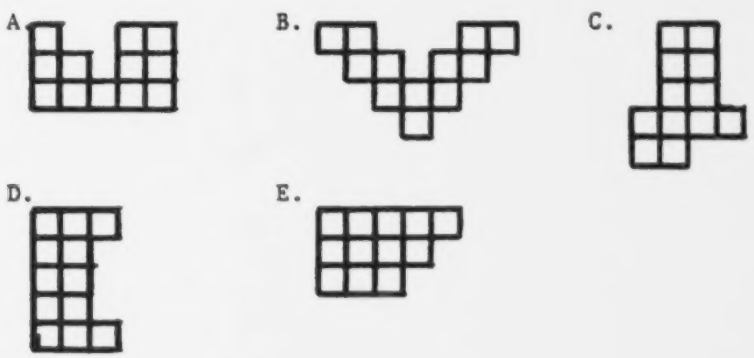
There was a crooked man
Who walked a crooked mile
He found a crooked sixpence
Under a crooked stile
He caught a crooked cat
Which caught a crooked mouse
And they all lived together
In a little crooked house.

Materials: A set of twelve square tiles or equivalent squares cut from cardboard, pencil, paper and a 12 x 12 square of graph paper for each child.

Activity: The crooked man wanted a garden behind his crooked house. He had 12 equal square tiles. How many different garden shapes could this crooked man make using the 12 tiles each time?

Procedure:

1. The children make as many gardens as time allows with the twelve square tiles, with the sides touching. After sufficient time for manipulation and discussion, suggest that the children draw their gardens on the square of graph paper. Some shapes may be as follows:



2. Cut out the shapes and compare with those of classmates. Are there any which are the same?

PROBLEM SOLVING ACTIVITY 1.14

Variations:

1. Which of your garden shapes has the longest distance around them. How could you find this out?
2. Are there gardens that have the same distance around? Which ones are they? Are they the same shape?

PROBLEM SOLVING ACTIVITY 1.15

Strategy: Guess and Check - Act it Out

Topic: Money recognition

Sing a song of sixpence
A pocketful of rye
Four and twenty blackbirds
Baked in a pie
When the pie was open
The birds began to sing
Wasn't that a dainty dish
To set before the King?
The King was in his countinghouse
Counting all his money
The Queen was in the parlour
Eating bread and honey.

Materials: A box of play or real money containing 4 pennies, 4 nickels, 4 dimes, a paper plate for each child, paper and pencil.

Activity: The King choose 4 coins in his countinghouse. There are pennies, nickels and dimes. What different combinations of 4 coins can the King choose?

Procedure:

1. The teacher chooses 4 coins. Placing the coins in her paper plate she describes and names the coins chosen. Teacher and children examine the penny (maple leaves), the nickel (beaver) and the dime (Bluenose) and discuss.
2. Sing or say the nursery rhyme and when "the King is in his counting house," the child takes a turn naming the coins and placing them in the paper plate.

Variations:

1. Slip a quarter (caribou) into the box and see how quickly it is chosen and recognized.
2. "King Counter" Game. Five children and one adult play the game. Place 5 pennies, 5 nickels, 5 dimes and 2 quarters into a wide-mouthed container. Slip the container into a sock or bag to make a "feely jar". The child places his or her hand in the jar, feels the coin, identifies it and draws it out to verify. The coin is returned to the jar after each child has had a turn. Each time a child correctly identifies a coin, he/she may receive a point. The one with the most points is declared a winner.

PROBLEM SOLVING ACTIVITY 1.16

Strategy: Guess and Check

Topic: Geometry

Materials: Three sets of straws with each set containing 3, 5, 6, 7, 8, 9 and 10 cm lengths, large pieces of paper and glue.

Activity: Select any 3 pieces of straws and make a triangle each time.

Procedure:

1. Discuss the shape of a triangle. Select and construct several triangles with the straw lengths. Which sets of 3 pieces could not be made into triangles?
2. On the large piece of paper, glue the triangles just constructed.

Variation:

What are the shapes when 4 straws are used?

PROBLEM SOLVING ACTIVITY 1.17

Strategy: Act It Out - Guess and Check

Topic: Number

Materials: 100 unifix blocks, pencil, paper, a calendar

Activity: Tori watches 3 hours of television each day. How much television does she watch in one school week?

Procedure:

1. The children must determine how a school week and a regular week differ. The daily calendar will be a useful aid.
2. After reviewing the number of days in a school week, have a child select and place 1 unifix block on the calendar to represent each hour of television watched.
3. Have the children skip count by 3's from Monday to Friday using the unifix blocks.

Variation:

1. What will Tori's television viewing time for the week be if she watches for 3 hours on Saturday and for 3 hours on Sunday?
2. What will Tori's television viewing time be if she watches 2 hours each school day and 4 hours during the weekend?

PROBLEM SOLVING ACTIVITY 1.18

Strategy: Act it Out - Make a Diagram

Topic: Number

Materials: Paper, pencil

Activity: Ricky's house is 3 blocks away from the school he attends. How many blocks does Ricky walk to and from school on Monday if he goes home for lunch?

Procedure:

1. Act out the activity, using the children's suggestions.
2. Represent the activity pictorially on the blackboard and have the children draw their own models on paper.
3. Draw the trips Ricky took on Monday. Record the total distance and discuss.

Variation:

1. Solve a problem of a similar nature, using:
   a. more children's homes,
   b. longer distances,
   c. distance walked in 2 days, 1 week and so forth.

PROBLEM SOLVING ACTIVITY 1.19

Strategy: Guess and Check - Look for a Pattern

Topic: Number

Materials: 3 empty boxes, (cut down milk cartons), 9 gummed stars, 12 paint brushes, 3 pencils, 6 paper clips, paper and pencil in the classroom may be used as well.

Activity: Mrs. Brown has 3 boxes and 6 paper clips. How many paper clips will she have in each box if she puts the same number of clips in each one? Help Mrs. Brown to sort equally 3 pencils, 12 paint brushes and 9 gummed stars into each of the three boxes.

Procedure:

1. Let the children sort the 6 paper clips so that there will be the same number of clips in each box. Continue in a similar manner with the other objects naming 3 sets of 1 pencil, 3 sets of 4 paint brushes and so forth. Have children identify the patterns.
2. Remove the objects from the boxes and draw on paper the set of objects in each box.

Variations:

1. Sort the objects into two even sets. Draw the objects. Which of the objects cannot be sorted evenly into sets?
2. Add a fourth box and repeat the sorting process using the same objects. Record the number sentences. Which of the objects can be sorted evenly into 4 sets?
3. Ask the children if they can find how many pairs of shoes are in their homes, if each member of their family has 2 pairs.

PROBLEM SOLVING ACTIVITY 1.20

Strategy: Using a Diagram

Topic: Number

Materials: One map for each student (see p.61), pencil crayons and paper.

Activity: How far is it from:

1. Alan's house to Lil's house?
2. Gary's house to Olga's house?
3. Ethel's house to Karen's house, past the school?

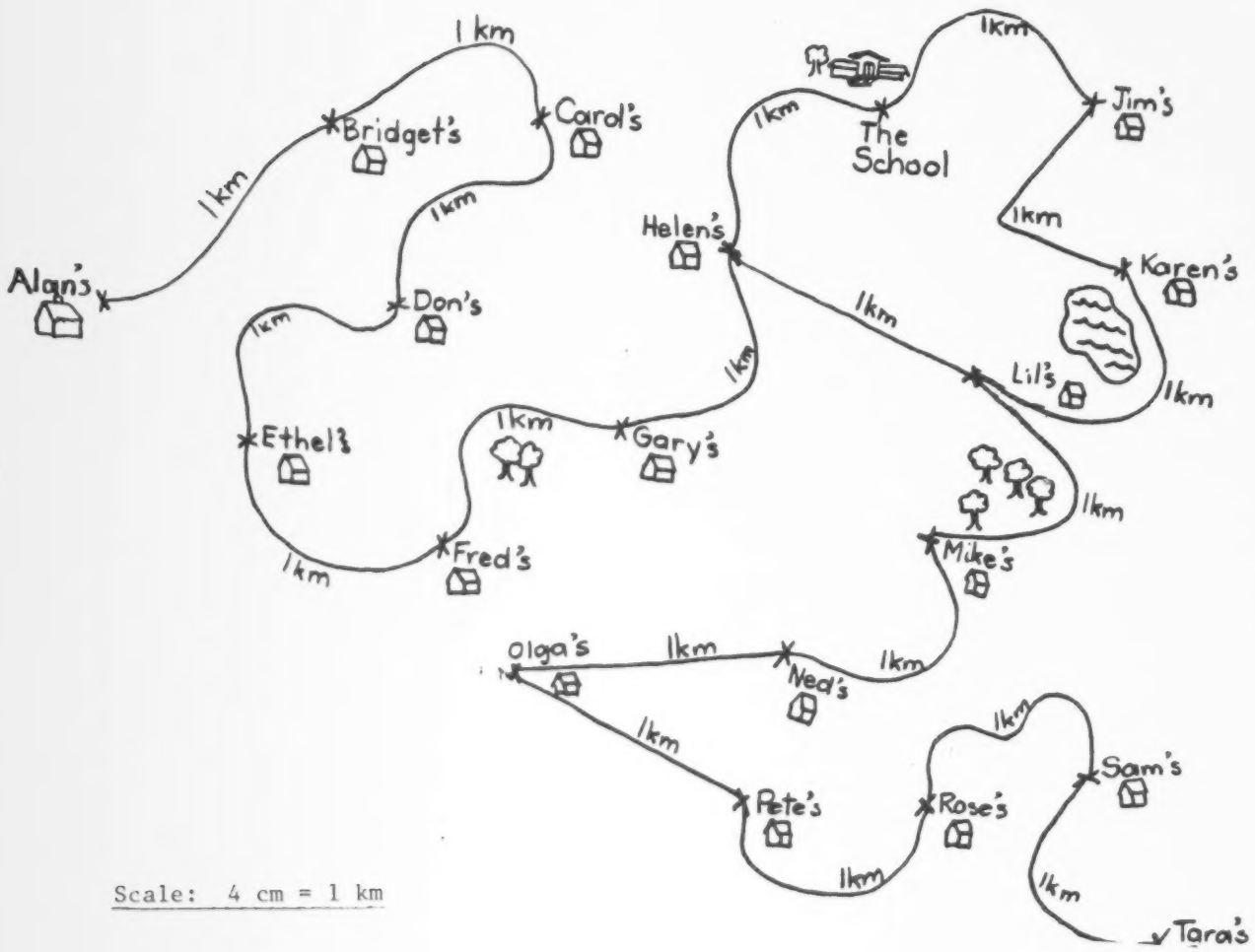
Procedure:

1. Using the map and a crayon, trace the route form Alan's to Lil's house. Discuss the two possible answers. Why are they both correct? The same reasoning will be true for two possible paths from Gary's to Olga's house. Have the children record each of the distances in km in a statement such as "It is 6 km from Ethel's house to Karen's house."

Variations:

1. Mike's alarm didn't go off one morning. Trace the shortest route with a crayon, which Mike can take to school. By how many km is Mike's route shorter? Which homes did Mike pass using the shorter route?
2. Who lives farther from school, Alan or Tara? How much farther? How did you get the answer?
3. How far will it be from Sam's house to Jim's house and back again?
4. Which is the shorter path; from the school to Ned's house or from the school to Fred's house? How much shorter is it?

PROBLEM SOLVING ACTIVITY 1.20



Scale: 4 cm = 1 km

Size of map may be varied to suit class needs - even to "walking" the path by drawing the map on the floor.

PROBLEM SOLVING ACTIVITIES GRADE 2

Note to Teachers

Re: Activities using Attribute Pieces

Although children may have experienced some of these activities in K and Gr. 1, they will benefit by doing them again as review and reinforcement.

CURRICULUM CHART

YEAR 2

	TOPICS										STRATEGIES					
	PROBLEM SOLVING ACTIVITY SHEET	COUNTING	NUMBER OPERATIONS	LINEAR	CAPACITY	AREA	TIME	MONEY	GEOMETRY	GRAPHING	GUESS AND CHECK	CLASSIFY	LOOK FOR A PATTERN	ACT IT OUT	DIAGRAM (DRAW, GRAPH)	WRITE A NUMBER SENTENCE
2.01	X							X				XX				
2.02								X			X					
2.03								X			X					
2.04		X								X		X				
2.05								X				X				
2.06		X								X			X			
2.07		X					X		X	X			X			X
2.08		X							X	X				X	X	
2.09	X	X								X			X			
2.10		X								X			X			
2.11		X								X			X			
2.12	X	X							X		X					
2.13		X	X							X			X	X		
2.14	X	X								X		X		X		
2.15			X		X									X		
2.16	X	X								X			X	X		
2.17	X	X											X			X
2.18	X	X								X			X	X		
2.19	X	X								X			X			X
2.20	X	X								X			X	X	X	
2.21	X	X					X			X			X			X
2.22	X	X								X			X	X	X	
2.23	X	X								X		X	X			
2.24	X	X					X			X			X	X	X	
2.25		X				X				X			X	X		
2.26		X								X			X	X		
2.27			X		X			X						X		
2.28				X					X	X	X		X	X		
2.29					X								X	X		
2.30		X				X			X	X			X	X		

PROBLEM SOLVING ACTIVITY 2.01

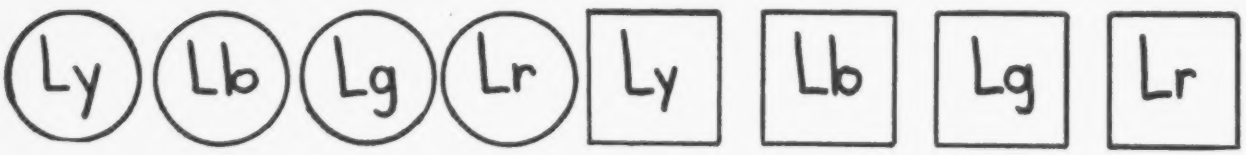
Strategy: Look for a Pattern - Guess and Check

Topic: Geometry

Materials: Attribute pieces (see pp.16, 17), one set for each of 6 to 8 children.

Procedure:

1. Have each child make the following pattern with the blocks.



2. Tell the children to shut their eyes. While their eyes are closed, remove a different piece from each child's pattern. Tell the children to open their eyes, and have each child identify which piece is missing from the pattern. Once a child has identified a piece, ask him/her to place the piece in the open space and determine if it is correct.

3. Repeat the above procedure several times, each time using a different pattern.

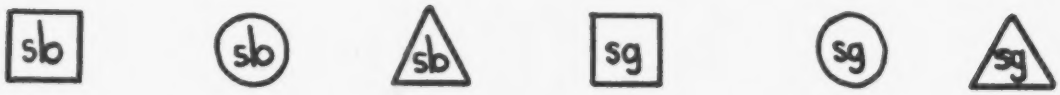
Note: If only one classroom set of pieces is available, the procedure will be slightly changed:

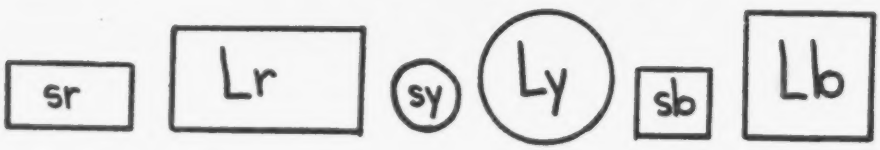
1. The teacher makes the pattern for the group to see.
2. The children shut their eyes while the teacher removes one piece from the pattern. Tell children to open their eyes. Select one child to tell which is the missing piece and let him/her place it in the open space. Discuss and verify with other children.
3. Repeat above procedure several times, using different patterns.

PROBLEM SOLVING ACTIVITY 2.01

Variations:

1. Repeat the procedure, using the following patterns:

a. 

b. 

PROBLEM SOLVING ACTIVITY 2.02

Strategy: Classify

Topic: Geometry

Materials: Attribute pieces (blocks and/or clue cards (see pp.16, 17), hula hoops or rope loops.

Preparation: A large area, table or floor, with attribute pieces placed in the middle.

Procedure:

1. Select one of the pieces, for example, the small blue square. Ask children to find all the pieces which:
   a. have the same shape
   b. are the same size
   c. are the same colour as the piece shown.

   After a.) and before beginning b.) the children return all the pieces to the centre. Follow the same procedure after b.) and before c.).
2. Repeat the activity, each time using a different piece until the children can classify the pieces with relative ease.

Variations:

1. Select an attribute piece which is:
   a. the same colour and size as the shown piece
   b. the same shape and colour
   c. the same size and shape

PROBLEM SOLVING ACTIVITY 2.03

Strategy: Classify

Topic: Geometry

Materials: Attribute pieces, (see pp. 16, 17), a set for each group of 6 to 8 children, hula hoops or rope loops.

Preparation: A large area, a table or floor with attribute pieces placed in the middle.

Procedure:

1. Select one of the pieces, for example, the large red triangle,

   Ask children to find all the pieces which are:

   a. different in shape and place them in a hoop or loop

   b. different in size and shape and place them in a hoop or loop

   c. different in colour and shape and place them in a hoop or loop

   d. different in colour, size and shape and place them in a hoop or loop

Note: If only one set of attribute pieces is available, after a. and before beginning b., have the children return all the pieces to the centre. Follow the same procedure after b. and before beginning c. and also before beginning d.

2. Repeat the activity, using a different piece each time, until the children can classify the pieces with relative ease.

Variations:

1. Ask the children to group all the pieces which are:

   a. not large and not square

   b. not square and small

   c. not red, not large and not round.

   Follow the same procedure as #1 and #2 above.

PROBLEM SOLVING ACTIVITY 2.04

Strategy: Patterns - Guess and Check

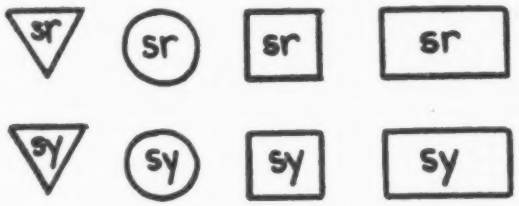
Topic: Geometry

Materials: Attribute pieces (see pp. 16, 17), group of 6 to 8 children.

Preparation: For this activity, the teacher brings a block patterned tablecloth, quilt or bedspread to the classroom for discussion. It is hung or laid on the floor. Through discussion, the children should become aware of a left-to-right patterned sequence. In addition the sequence may repeat vertically.

Procedure:

1. Show the children the following pattern. Study it carefully.



2. The children close their eyes while the teacher removes a piece in the pattern.
3. The children must now identify the missing piece, and place it in the open space for verification.
4. Give each member of the group a turn at removing a piece, while the others identify and verify.

Variations:

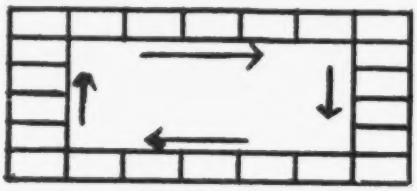
1. Make a pattern of 3 rows of 4 pieces, and remove a piece. Replace it and verify.
2. Remove two pieces. Verify.
3. Remove one row. Verify.
4. Remove a column. Verify.

PROBLEM SOLVING ACTIVITY 2.05

Strategy: Patterns

Topic: Geometry

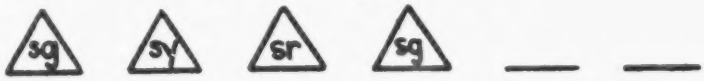
Materials: Attribute pieces, (see pp. 17, 18). Open game board make out of a large piece of bristolboard marked off as shown below.



Preparation: Construct the required number of game boards. Identifying patterns, continuing patterns.

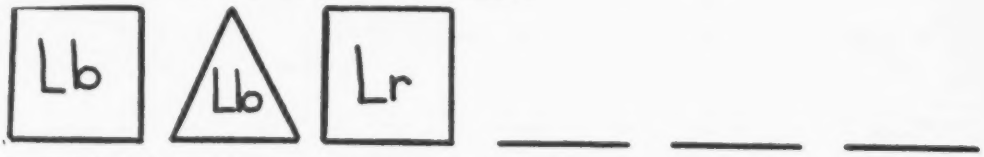
Procedure:

1. Teacher starts a pattern on the game board.
   eg.



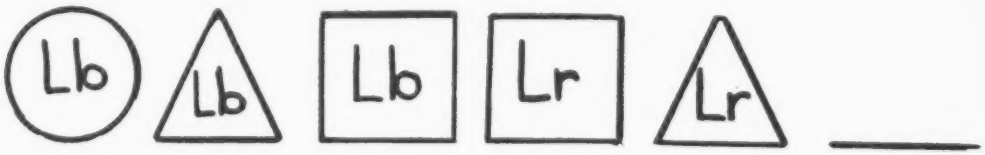
   Children identify and continue the pattern around the board.

2. Teacher marks a new pattern on the board.
   eg.



   Children identify and continue the pattern.

3. Teacher starts a pattern. (Note reversal in shape)
   eg.



   Children identify and continue pattern.

Variation:

Develop completed patterns and present them to the class for identification.

PROBLEM SOLVING ACTIVITY 2.06

Strategy: Act it Out - Guess and Check

Topic: Number

Materials: Catalogue cut-outs of 2 sweaters, and 3 slacks or skirts - 1 set for each group. Flannel board cut-outs.

Activity: How many different outfits can you make?

Procedure:

1. Children estimate the number of combinations possible.
2. Children arrange the cut-outs, making outfits - each one being different.
3. As the cut-outs are arranged, the findings are recorded by the teacher.
4. Children refer to their estimation and check with their answer.

Variation:

1. Increase the number of items and have the children make all possible combinations and record the findings.
2. Using cut-outs of 2 girls and 4 boys, how many different pairs of boy-girl pairs can we make? Let the children act this out.

PROBLEM SOLVING ACTIVITY 2.07

Strategy: Act it Out - Guess and Check - Write a Number Sentence

Topic: Money, Number

Materials: An assortment of 1¢, 5¢ and 10¢ play money or real money, a chart to record results.

Activity: In how many different ways can you use 1¢, 5¢ and 10¢ coins so that the total value would be 10¢.

Procedure:

1. Choose the coins you will need to make 10¢ if you use
   a) only pennies
   b) pennies and nickels
   c) only two coins
   d) only one coin
2. Transfer the findings to a chart.

e.g.

1¢	5¢	10¢	Total
10	0	0	= 10¢
5	1	0	= 10¢
0	2	0	= 10¢
0	0	1	= 10¢

3. Print a number sentence for each way:
   e.g. 1¢ + 1¢ + 1¢ + 1¢ + 1¢ + 5¢ = 10¢
4. Which was the smallest number of coins used to make 10¢, the largest number?

Variations:

1. Extend the problem idea using larger and/or smaller amounts of money e.g. 25¢, 50¢, 17¢, 19¢.
2. Have the children set up a play store by bringing in empty containers and boxes. Have each child purchase one article and choose the correct coinage.
3. Introduce the idea of over payment and the necessity for change.

PROBLEM SOLVING ACTIVITY 2.08

Strategy: Make a Diagram - Write a Number Sentence - Guess and Check

Topic: Number

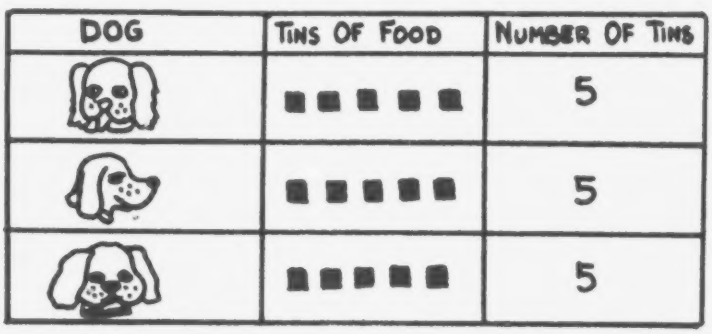
Materials: Concrete objects or cut-out pictures to represent each dog and tins of food. Chart to record the findings.

Activity: A dog eats 5 tins of dog food in 1 week. How many tins of dog food will be needed to feed 3 dogs for 1 week?

Procedure:

1. Estimate the number needed.
2. Discuss the number of tins needed. Children use the materials to show how they arrived at their answers.
3. Children make a diagram to illustrate their findings.

   eg.



4. The children should write a number sentence to show the findings.

   eg. $5 + 5 + 5 = __$ or $3 \times 5 = __$

Variation:

How many tins of dog food would have to be bought to feed 3 dogs for 2 weeks, if each dog eats 5 tins of food a week?

PROBLEM SOLVING ACTIVITY 2.09

Strategy: Guess and Check - Act It Out, Pattern

Topic: Number

Materials: A book containing one hundred plus pages, one hundred chart, paper and pencil to tally.

Activity: Lesley has been asked by an author to number the pages of a book from 1 to 100. How many times will Lesley write the number 4?

Procedure:

1. Estimate the number of times Lesley will write the number.
2. Count the pages in the book. Tally each numeral 4. Verify the findings using the hundred chart.

Variations:

1. How many times would Lesley use a 0 when numbering the pages from 1 to 100?
2. Peter begins printing every other numeral starting with 1. What will the 13th numeral be?
   e.g. 1, 3, 5, ___, ___, ___, ___, ___, ___, ___, ___, ___, ___.
3. If Tracy begins with the numeral 2 and prints every other numeral, what will the 10th numeral be?
   e.g. 2, 4, 6, ___, ___, ___, ___, ___, ___, ___.

PROBLEM SOLVING ACTIVITY 2.10

Strategy: Act it Out - Guess and Check

Topic: Number

Materials: Bingo chips, buttons, or other counting materials, paper on which to illustrate the answer, paper with many Martian heads. (see p. 82)

Activity: Each Martian has 3 eyes, how many eyes would there be if 9 Martians get out of the space ship?

Procedure:

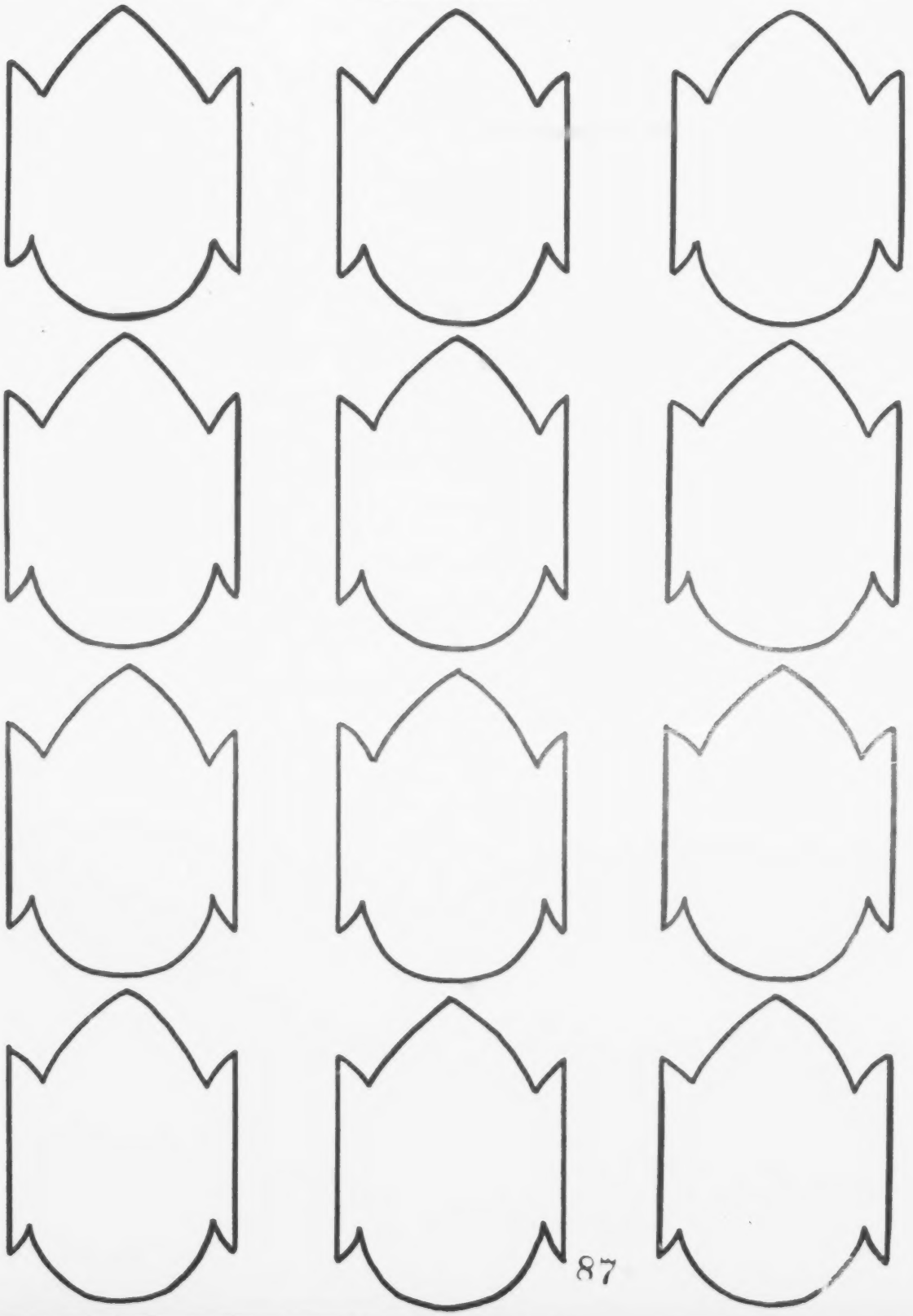
1. Estimate the number of eyes the 9 Martians would have.
2. Show how you could find the answer.
3. Write a number sentence to show the results.

Variations:

1. How many eyes are there in total if there are 2 Martians? 8 Martians? 10 Martians?
2. How many eyes are there if there are 4 Martians and 2 people? 5 Martians and 4 people?
3. How many Martians got off the space ship if there are 15 eyes? 18 eyes? 21 eyes?
4. How many Martians and people are there if there are 14 eyes? 18 eyes? Are there different possibilities? If so, list them.

PROBLEM SOLVING ACTIVITY 2.10

Martian Heads



PROBLEM SOLVING ACTIVITY 2.11

Strategy: Guess and Check - Act it Out

Topic: Number

Materials: Plasticene and toothpicks, concrete counters, blocks, beads, stones, bingo chips or sticks, paper for diagramming.

Activity: On the planet Mars, some creatures have 3 legs and some have 2 legs. If one sees seven legs; how many could there be with 2 legs and how many could there be with 3 legs?

Procedure:

1. Estimate the number of 2 legged and 3 legged creatures you think there will be.
2. Have children make the creatures using plasticene and toothpicks.
3. Have children illustrate the answer on paper.
4. Have children write a number sentence to show the results.

Variations:

1. Some creatures have 4 legs and others have 2 legs. There are 18 legs altogether. How many creatures are there with 4 legs and how many creatures with 2 legs? List all possibilities by writing number sentences.
2. Some Martians have 4 eyes, others have 3 eyes and still others have 2 eyes. If there are 20 eyes in the room, how many Martians are there with 4 eyes, with 3 eyes, and with 2 eyes? Is there more than one answer? How many? Write a number sentence for each.

PROBLEM SOLVING ACTIVITY 2.12

Strategy: Classify

Topic: Number

Materials: Pictures of food such as cut-outs from grocery store flyers. Hula hoops or rope loops and chart paper.

Activity: Billy is learning about the various food groups. As he learns he finds he doesn't know enough about the bread and cereal group. How can we help him learn all the foods which are in the group?

Procedure:

1. Children sort and classify the materials they have, into various groupings or sets, placing them in the hoops or on chart paper.

   e.g. - crackers
   - breakfast foods
   - foods of the same colour
   - foods prepared at home
   - store bought foods
   - tasty foods
   - don't like to eat foods and so forth.

2. Children suggest other items which could belong to the group and the teacher or child writes it on a word card and places the word card in the appropriate hoop. Thus vocabulary is developed.

Variations:

1. Milk Products - children classify according to empty containers or pictures.
2. Meat and meat alternatives - children classify pictures.
3. Fruits - children classify actual items or pictures into various categories.
4. Sorting seeds: wheat, oats, barley and others.

PROBLEM SOLVING ACTIVITY 2.13

Strategy: Act It Out - Diagram - Guess and Check

Topic: Number, Linear

Materials: Dishes or concrete materials to represent dishes, paper.

Activity: If 10 dishes of cat food were set out 10 metres apart, how far would a hungry tiger have to travel starting at the first dish to reach the tenth dish of food assuming that he goes from one dish to the next in order?

Procedure:

1. Estimate the number of metres the hungry tiger would have to go to eat the food from every dish.
2. Children manipulate the concrete materials to find the answer.
3. Children may illustrate the travel path on paper.

Variations:

1. The postman brings the mail to houses that are 10 m apart. Today he has walked 60 m. To how many houses did he deliver the mail in the 60 m of walking?
2. If 9 dishes are 10 m apart, and two cats started eating, one cat from each end and moving at the same pace from dish to dish, at which dish will the two cats meet? How many dishes of cat food would each cat eat? How many metres would each cat travel?

PROBLEM SOLVING ACTIVITY 2.14

Strategy: Make a Diagram - Look for a Pattern - Guess and Check

Topic: Counting

Materials: Gummed stickers to represent pictures to be drawn. Paper for diagramming and a scrapbook.

Activity: A scrapbook has 6 sheets, and it can hold 5 pictures on each side of a sheet. How many pictures will there be when the scrapbook is full?

Procedure:

1. Estimate the number of pictures you think the scrapbook will hold when it is full.
2. Ask the children how they can determine the total number of pictures.
3. Discuss and decide on a method.
4. Carry out the method.
5. Tabulate the results

   1 sheet (both sides) has 10 pictures
   2 sheets ←——— have ____ pictures
   3 sheets ←——— have ____ pictures

Variations:

1. Make similar problems using a different number of sheets and pictures on each page.
   e.g. 7 pages with 3 pictures per page, or 20 pages with 4 pictures per page.
2. How many pictures do Mary and John have together if each one has a 10 sheet scrapbook with 5 pictures on each page?

PROBLEM SOLVING ACTIVITY 2.15

Strategy: Diagram

Topic: Measurement - Area readiness

Materials: square tiles, coloured cubes, squared paper, (see page 88), scissors, glue, crayons and string.

Activity: An airplane landed near some strange islands. The four people on board decided to each find an island of their own to live on. Each island was different in shape and was made of 5 equal squares. Make the four islands.

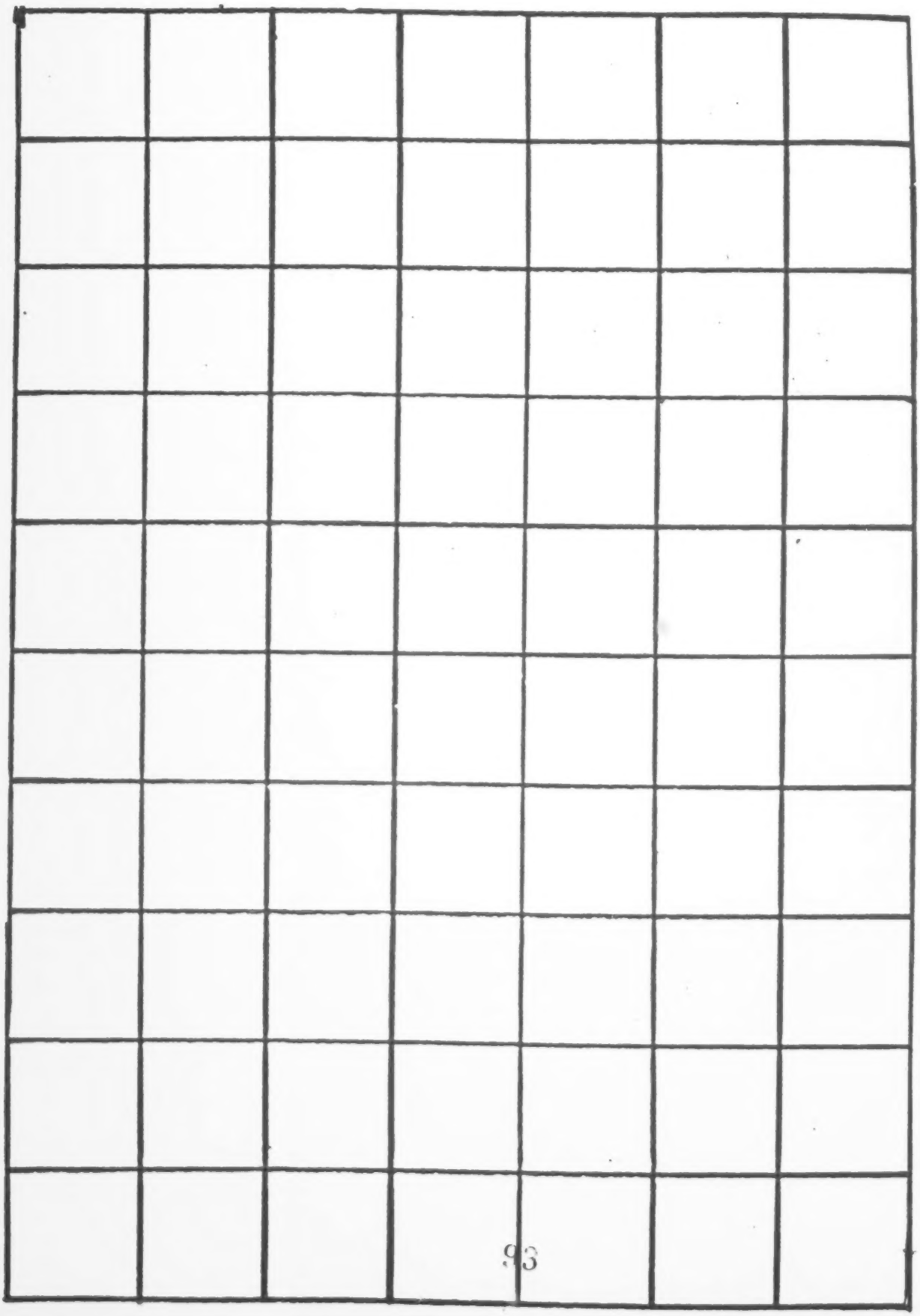
Procedure:

1. Children should be encouraged to use a variety of materials in order to make different shapes.
2. The children should draw their various shaped islands on squared paper, colour them, cut them out and compare with those of other children.

Variations:

A discussion about shape should follow.

e.g. Which one of these islands has the longest distance around it?
How can you find out?
How long is it?
Which one has the shortest distance around it?



PROBLEM SOLVING ACTIVITY 2.16

Strategy: Act it Out - Diagram - Guess and Check

Topic: Number

Materials: Paper

Activity: I read a good story. I will let you read the story and you will let 2 friends read it. Each of your 2 friends let 2 more friends read it. How many people will read the story?

Procedure:

1. Estimate the number of people you think would read the story.
2. Act out the problem.
3. Diagram.

Variations:

1. Similar problems may be written.
2. Family tree type problems can be written where Mr. Smith married Mrs. Smith and they had 2 children. Each of their children married and they had 3 children each. How many people are there in the family?
3. The children may construct their own family trees.

PROBLEM SOLVING ACTIVITY 2.17

Strategy: Act it Out - Write a Number Sentence

Topic: Number, Counting

Materials: A variety of concrete aids such as buttons, blocks, sticks, strips of paper to represent shelves, paper to record findings.

Activity: There are 80 jars of pickles and there are 8 shelves. In how many different ways can we arrange the jars on the shelves if each shelf can hold at the most 12 jars?

Procedure:

1. Children work in small groups to arrange the materials.
2. Children illustrate the results on paper and record the findings.
   e.g. 1st shelf holds 10 jars
   2nd shelf holds 6 jars
   3rd shelf holds 8 jars and so forth.
3. Discuss the various arrangements.
4. Children write a number sentence to show the results.

Variations:

1. If the 80 jars are moved so there are 20 jars on each shelf, how many shelves will be used?
2. Make similar problems using varying numbers of shelves and jars.

PROBLEM SOLVING ACTIVITY 2.18

Strategy: Act it Out - Diagram - Guess and Check

Topic: Counting, Number.

Materials: Ten blue socks and 10 red socks or pieces of paper to represent socks, a box or bag to hold socks, paper for diagramming, a blindfold.

Activity: There are 10 blue socks and 10 red socks in a box. It is too dark in the room to see the colours of the socks. How many socks will have to be taken out of the box to make sure there is a matching pair?

Procedure:

1. Estimate the number of socks you think you would have to take out.
2. Children act out the problem.
3. Children diagram the results.

Variations:

1. If there were 5 red socks, 5 yellow socks and 5 blue socks how many socks would have to be pulled out of the box to be sure that there is one pair of the same colour?
2. How many socks have to be pulled out to be sure there is one pair of any colour if there are 5 of each red, yellow, blue and green socks?

PROBLEM SOLVING ACTIVITY 2.19

Strategy: Act it Out - Write a Number Sentence - Diagram - Guess and Chec

Topic: Number Counting

Materials: Chairs, paper for diagramming

Activity: When the airplane left Brandon, there were 15 passengers on board. In Calgary 9 people got on and 7 got off. How many people were on the airplane when it left Calgary?

Procedure:

1. Estimate the number of people you think would be on the airplane when it left Calgary.
2. Act it out.
3. Children draw a diagram.
4. Children write a number sentence.

Variations:

1. Similar problems may be written changing the number of people arriving and departing. Example, twelve people got on the bus at The Pas. At Swan River a mother with 1 set of twins got on, and 3 passengers got off. How many people were on the bus?
2. Other problems may be contrived where students are asked how many people could be on the plane, bus or train, including stewardesses, pilots, drivers, conductors and others. All problems, should involve actinv out solutions and should be disucssed and number sentences should be written.

PROBLEM SOLVING ACTIVITY 2.20

Strategy: Act it Out - Diagram - Write a Number Sentence - Guess and Check

Topic: Number, Counting

Materials: Concrete materials to represent books or actual books, paper to diagram.

Activity: How many books are in the stack if 6 books are on top of a book called "Bambi" and eight books are below the book?

Procedure:

1. Estimate the number of books you think would be in the stack.
2. Act it out. Have each child make the stack.
3. Make a diagram of the stack and label the book "Bambi".
4. Write a number sentence.

Variations:

1. Similar problems can be written by adding another part to the problem such as: What would happen to the total number of books in the stack if someone took 3 books off the top? Where would "Bambi" be in the stack now, counting from the top down?
2. The problem may be changed by substituting different numbers for the number of books on top and below a book.

PROBLEM SOLVING ACTIVITY 2.21

Strategy: Write a Number Sentence - Guess and Check - Act it Out

Topic: Number, Money

Materials: A supply of real or play money for each child (1¢, 5¢, 10¢, 25¢)

Activity: Bob has 20¢. He spends 6¢ on gum. Then he earns 13¢. How much money does he have now?

Procedure:

1. Estimate the amount of money you think Bob has now.
2. Act it out using money.
3. Write a number sentence.

Variations:

1. If Bob has 25¢ and he wants to buy 3 pencils costing 8¢ each, will he have enough money? How much will he have left?
2. Bob has 20¢ and Jeff has 15¢. Together they want to buy 7 apples that cost 5¢ each? Have they enough money to pay for the apples? Write a number sentence.

PROBLEM SOLVING ACTIVITY 2.22

Strategy: Act it Out - Make a Diagram - Write a Number Sentence - Guess and Check

Topic: Number

Materials: Toy cars, bingo chips, buttons, paper for illustrations.

Activity: There are 6 cars in the showroom. Each car has a spare tire in the trunk. How many tires do the 6 cars have in total?

Procedure:

1. Estimate the number of tires you think there would be.
2. Children choose materials and act it out.
3. Children draw diagram to show their findings.
4. Children write a number sentence.

Variations:

1. There are 6 wheels on a semi-trailer. How many wheels are there on 2 semi-trailers and 2 cars (no spares included)?
2. There are 18 new tires to be put on semi-trailers with 6 wheels. How many semi-trailers can get new tires if each semi-trailer gets all new tires?

PROBLEM SOLVING ACTIVITY 2.23

Strategy: Act it Out - Look for a Pattern - Guess and Check

Topic: Counting, Number

Materials: One hundred chart

Activity: As Sam walks to the store he counts every second step he takes. He starts counting on 2 and reaches 40 by the time he reaches the store, how many steps did he count in all?

Procedure:

1. Estimate the number of steps you think he counted.
2. Act it out.
3. Using the hundred chart, circle the counted numbers and discuss.

Variations:

1. Look for the pattern and fill in the blank spaces.
   a) 4, 8, 12, __, __, __.
   b) 3, 6, 9, __, __, __.
   c) 10, 20, 30, __, __, __.
   d) 100, 90, 80, 70, __, __, __.
   e) 13, 10, 7, __, __.
   f) 1, 3, 5, __, __, __.
   g) __, __, 10, 15, __, 25.
2. Use the hundred chart to find new patterns.

PROBLEM SOLVING ACTIVITY 2.24

Strategy: Act it Out - Diagram - Write a Number Sentence - Guess and Check

Topic: Money. Counting. Number

Materials: A bag of play money for every 2 children (nickels and pennies only), paper for illustrations.

Activity: Mary found 63¢. There were 19 coins in all. The coins were nickels and pennies. How many nickels and pennies were there?

Procedure:

1. Estimate the number of nickels and pennies you think there were.
2. Act it out.
3. Children draw as many different diagrams as they can.
4. Write a number sentence.

Variations:

1. Show the different combinations for 63¢ by using any number of dimes, nickels and pennies.
2. If Mary could use any number of quarters, dimes, nickels or pennies to make 63¢, show different ways she could do this.
3. If 4 dimes are used how many pennies will be needed to equal 63¢?
4. Bob has 2 nickels and 3 pennies, what other coins can he use to get 63¢? Show as many ways as possible.
5. Find the smallest number of coins which will equal 63¢ using quarters,dimes, nickels, and pennies.

PROBLEM SOLVING ACTIVITY 2.25

Strategy: Act it Out - Diagram - Guess and Check

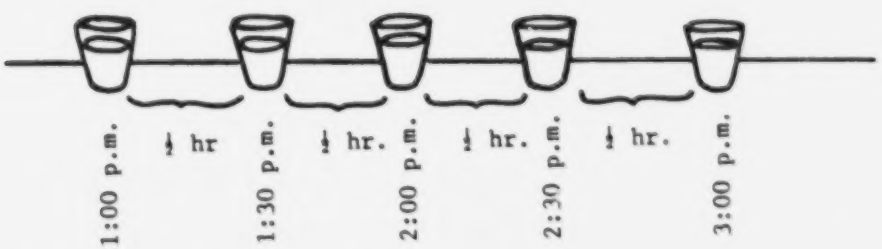
Topic: Number. Time.

Materials: Clock, paper cups, paper to diagram results.

Activity: There are 5 glasses of water. If Michael drinks one glass of water now, and one glass of water every half hour following, how much time will it take to drink all the water.

Procedure:

1. Estimate how long you think it will take to drink all the water.
2. Act it out.
3. Make a diagram



Variations:

1. How long will it take to empty 9 glasses, 12, 13 if one glass is emptied every half-hour?
2. Bob's mother is inviting his friends to Bob's birthday party. If she phoned one friend now, and one friend every half hour following, how many friends will be invited to the party in 4 hours?
3. If Mary has a cold and has to take a cough candy every half hour, starting at 8:00 a.m., how many cough candies will have been taken by 2:00 p.m.?

PROBLEM SOLVING ACTIVITY 2.26

Strategy: Act it Out - Guess and Check - Diagram

Topic: Number

Materials: Paper for illustrations, unifix cubes or other representative material, strips of circles, crayons.

Activity: What is the fewest number of boys in a row if there is a boy in front of 2 boys, a boy behind 2 boys, and a boy between 2 boys?

Procedure:

1. Estimate the number of boys in the row.
2. Act it out.
3. Using concrete materials, make a model.

Variations:

1. Distribute a strip of circles as shown.

   a. Colour circle(s) red, which is/are in front of any two other circles.
   b. Colour circle(s) blue, which is/are behind any two other circles.
   c. Put a box around the circle(s) which is/are between two circles.

2. Using the same directions, have the children attempt the activity using 5 circles, 6 circles.

PROBLEM SOLVING ACTIVITY 2.27

Strategy: Diagram

Topic: Geometry. Measurement (Area Readiness) Counting.

Materials: Graph paper (see p. 101) one sheet for each child, coloured pencils, scissors, (Geoboards may be used as well for this activity).

Activity: How many different rectangles can be drawn on your graph paper if the rectangles do not overlap but may have common sides? What is the biggest rectangle and the smallest rectangle you can make?

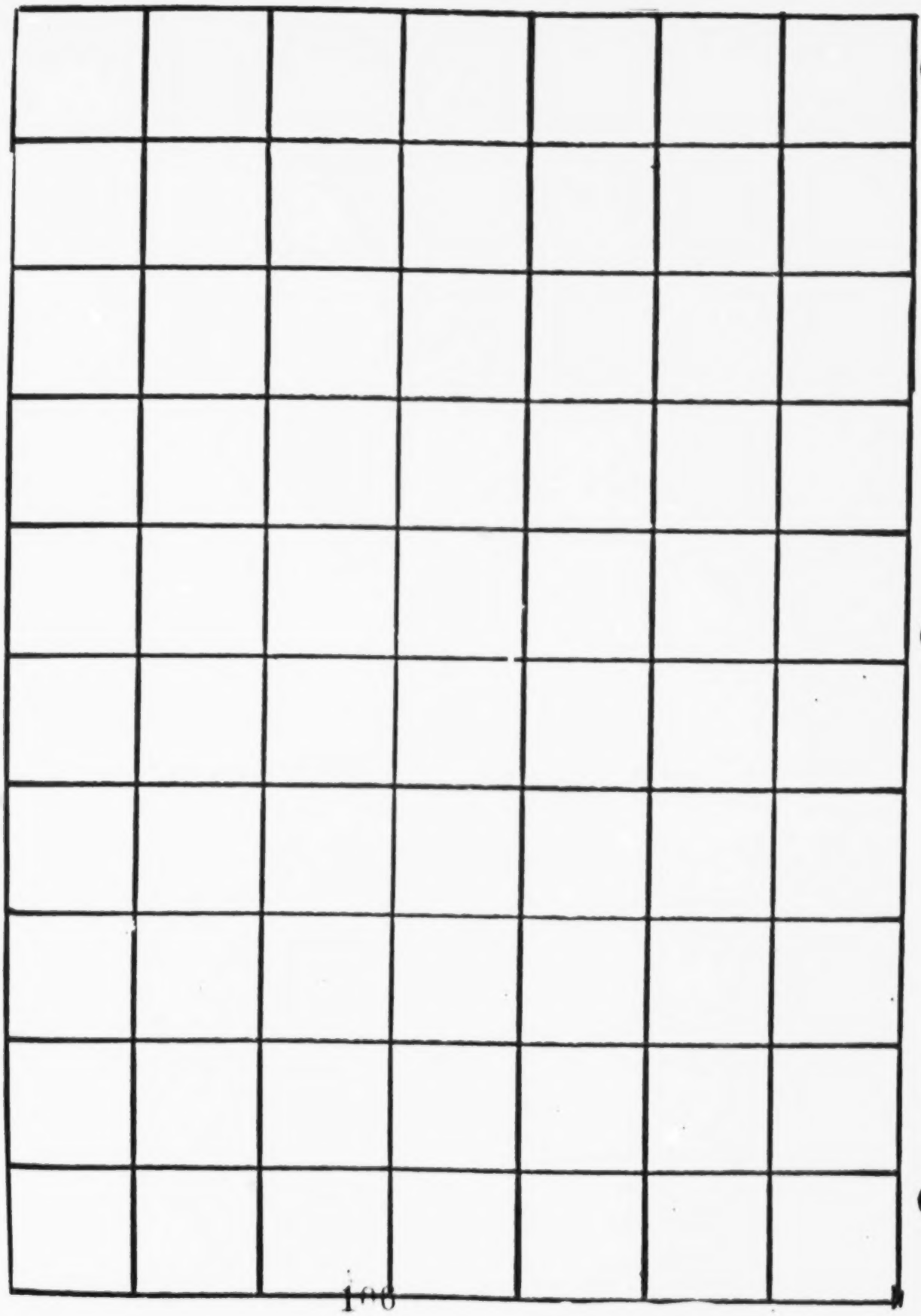
Procedure:

Note: Children will have to identify a rectangle.

1. Let children construct as many different rectangles as they can, using a coloured pencil.
2. Which of your rectangles is the largest one, the smallest? How do you know?
3. Cut out the rectangles and line them up from the smallest to the largest.
4. Which one of the children has the largest rectangle? the smallest? The most rectangles?

Variation:

Make various squares. Use same procedure as above.



PROBLEM SOLVING ACTIVITY 2.28

Strategy: Act it Out - Diagram - Classify - Guess and Check

Topic: Capacity

Materials: Various materials for measuring capacity such as beans, corn kernels, sand or rice, graph paper, and 3 to containers of differing capacities and shpaes.

Activity: Show the children three containers. Which container holds the most?

Procedure:

1. Estimate which container holds the most.
2. Act it out. Order the containers according to capacity from large to small.

Variations:

1. a. Introduce a fourth container of a different size and shape.
   b. Order the 4 containers according to capacity.
2. Introduce the fifth and sixth containers and follow the above procedure.
3. Pictograph the results with the class.

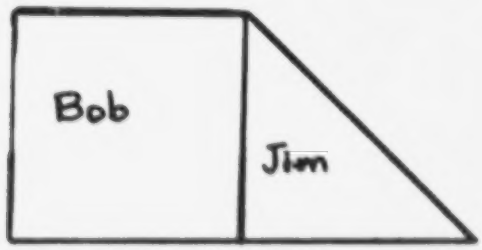
PROBLEM SOLVING ACTIVITY 2.29

Strategy: Act it Out - Diagram

Topic: Measurement

Materials: Diagram of farm (see p. 104), scissors, graph paper.

Activity: Mr. & Mrs. Smith are retiring to live in Brandon. They want to give the farm to Bob and to Jim. If they divide the farm as shown below, which one would get more land? How much more?



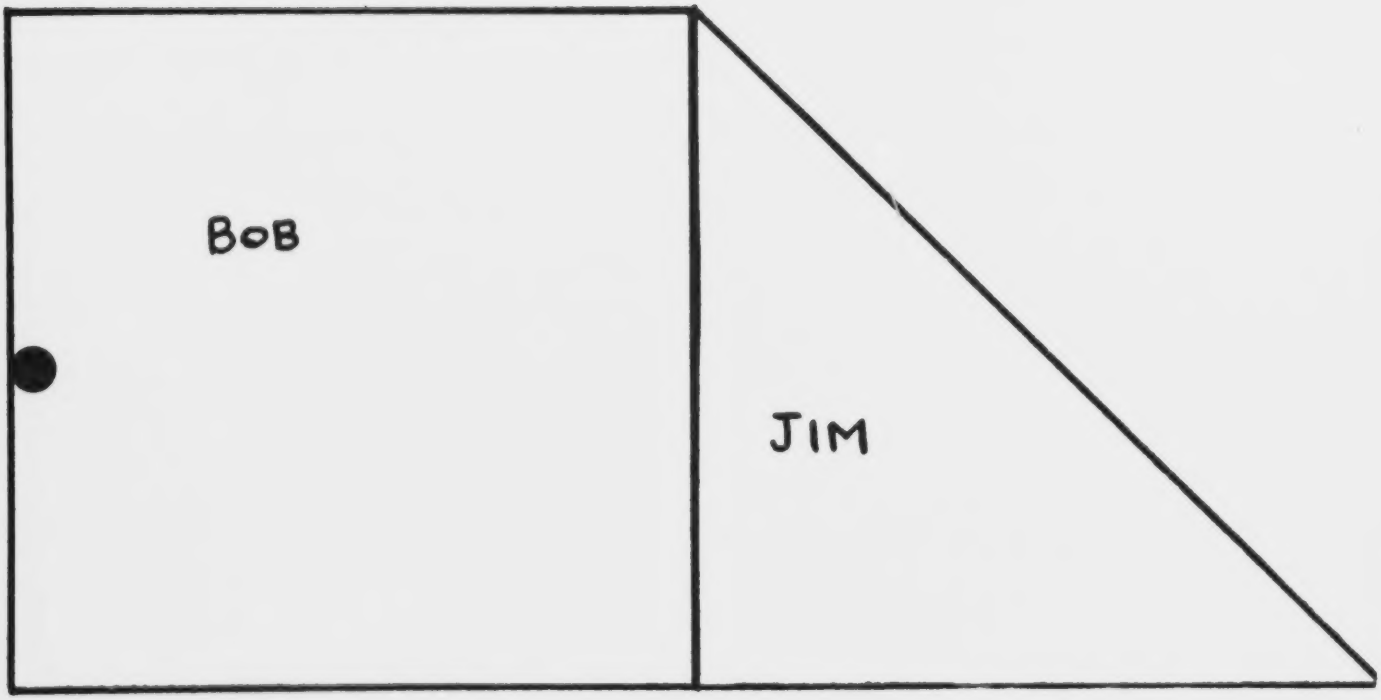
Procedure:

1. Who do you think will get more land? Why?
2. Find out how much more land by cutting the pieces and comparing.

Variations:

1. Using graph paper, make a rectangle and show how it could be divided to give each of 2 people an equal amount of land. Draw another rectangle the same size and divide it to give each of 4 people the same amount.
2. Using graph paper, draw a rectangle and show how it can be divided to give each of 3 people the same amount.

PROBLEM SOLVING ACTIVITY 2.29



PROBLEM SOLVING ACTIVITY 2.30

Strategy: Guess and Check, Act it Out

Topic: Number

Materials: A variety of concrete objects such as stones or bingo chips, chart paper. Calendar sheet for one month.

Activity: Glen sleeps 10 hours a night and his mother sleeps 8 hours a night. Who slept more hours? How many more hours?

Procedure:

1. Estimate the number of hours of sleep Glen gets in one week. Estimate the number of house of sleep his mother gets in one week.
2. How many more hours of sleep do you think Glen gets than his mother in one week?
3. Act it out using concrete materials.
4. Draw a chart.

Hours of Sleep

	Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	TOTAL
Glen								
Mom								
Difference								

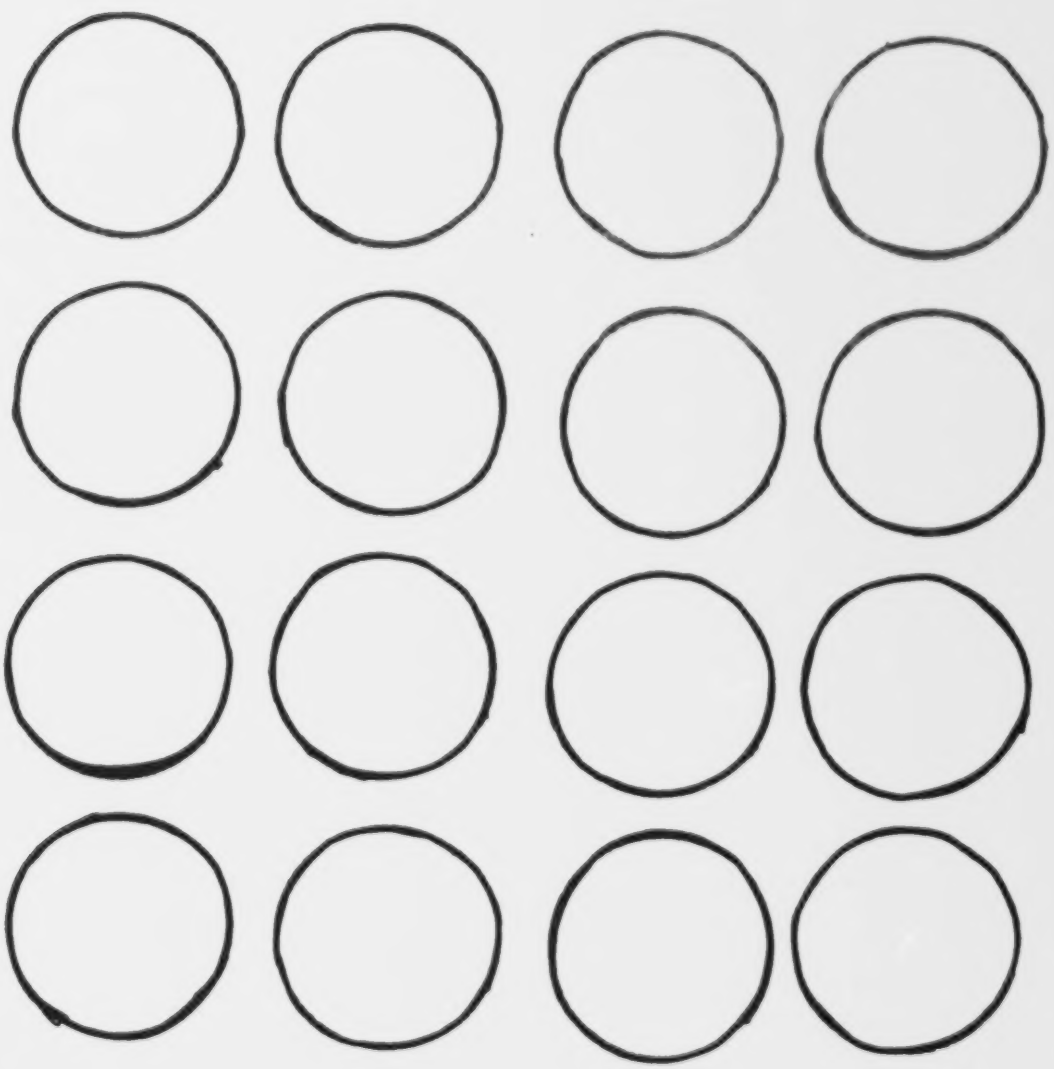
Variation:

1. How many hours of sleep do you get in February if you sleep 10 hours each night? How many hours more of sleep do you get in February than your mother if you sleep 10 hours each night and she sleeps 8 hours each night?

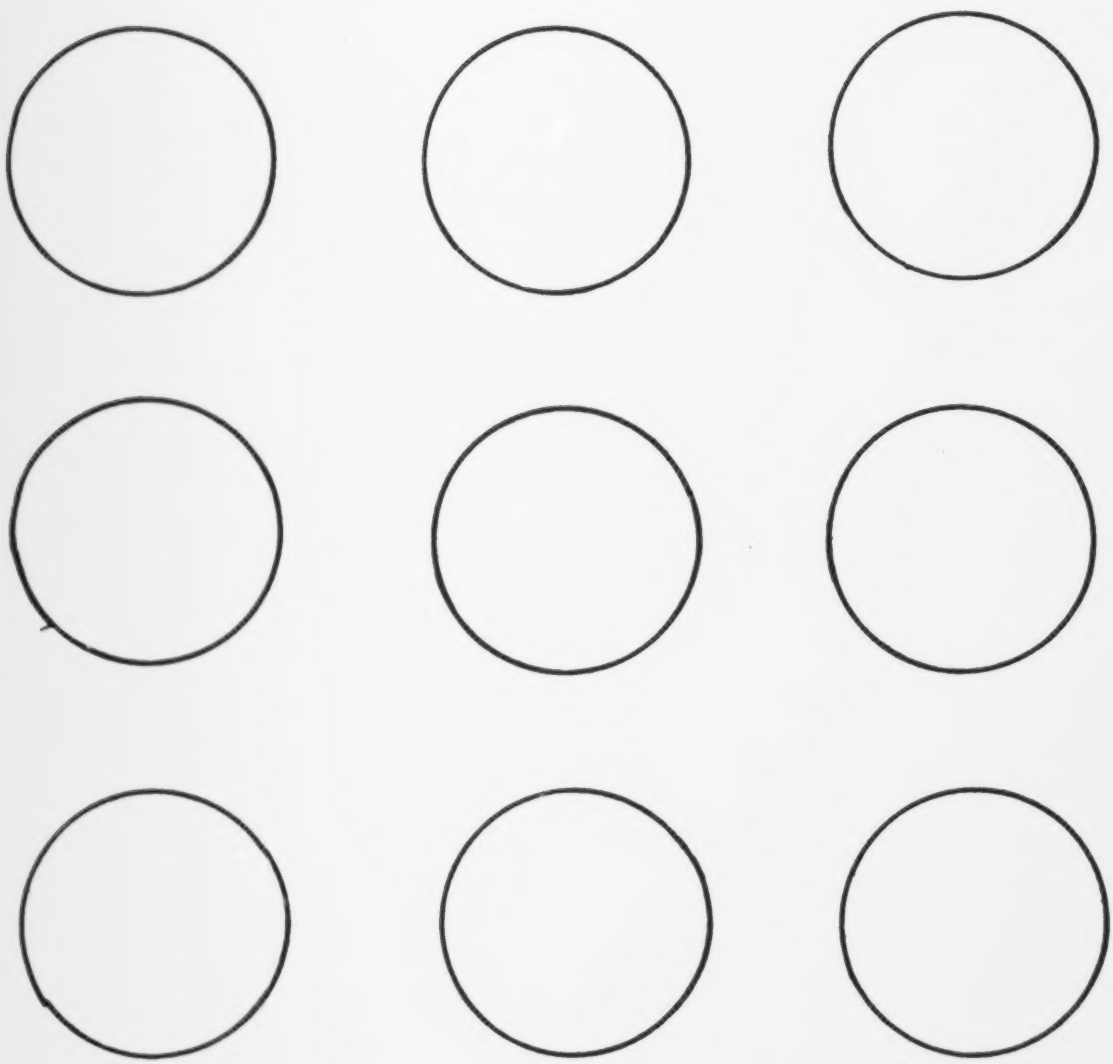
ASSORTED PROBLEMS

YEAR 2

1. In five minutes see how many objects you can make using circles below or on next page. A circle(s) should be the main part of whatever you make. With a pencil add lines to the circles to complete the picture. The lines can be inside the circle, outside or both. Think of as many different things as possible.

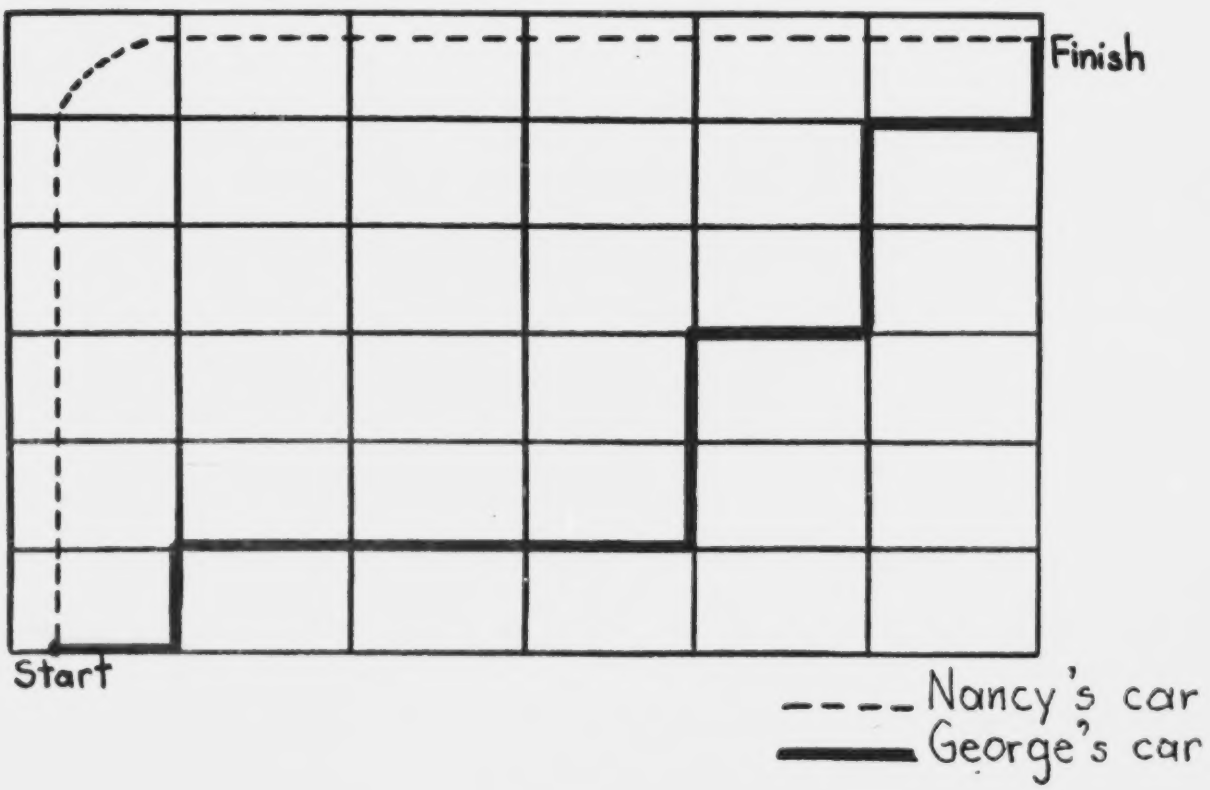


ASSORTED PROBLEMS



ASSORTED PROBLEMS

2. Nancy and George are racing their hot wheel cars. They are racing at the same speed. By studying the map below, who finished first? Why?



a) If you were in the race, draw a different route from start to finish. Would you come in first, second or third? Prove it using a string.

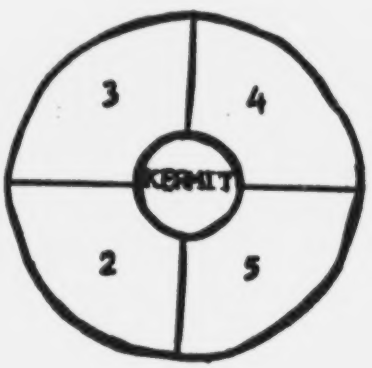
b) Make a string diagram to show the lengths.

NAME	Length in cm
Nancy	
George	
My way	

ASSORTED PROBLEMS

3. Miss Piggy throws pies at Kermit, the frog. She throws 4 pies before hitting Kermit. After throwing, her total score is 18. Which numbers do her pies hit? List the possibilities.

KERMIT TARGET



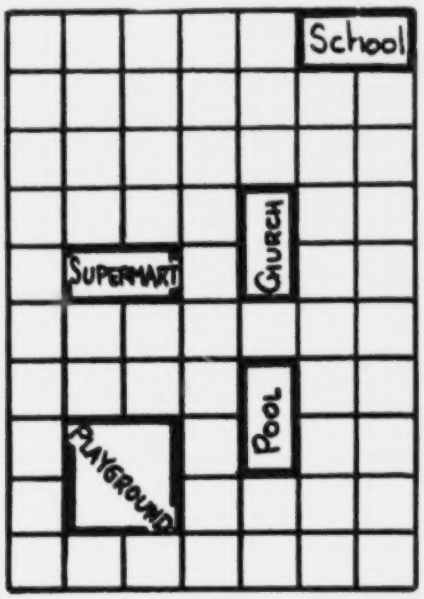
b. Which numbers does Miss Piggy hit if she throws 5 pies before she hits Kermit and the total is 18?

c. Which numbers does Miss Piggy hit if she throws 6 pies before she hits Kermit and the total is 18?

d. Which numbers does Miss Piggy hit if she throws 5 pies before she hits Kermit and the total is 22?

ASSORTED PROBLEMS

4. a) Find the shortest path from the playground to the school? Draw it using a crayon. Is there another path that is just as short? Show it on the map with a different colour. One must always stay on the lines.



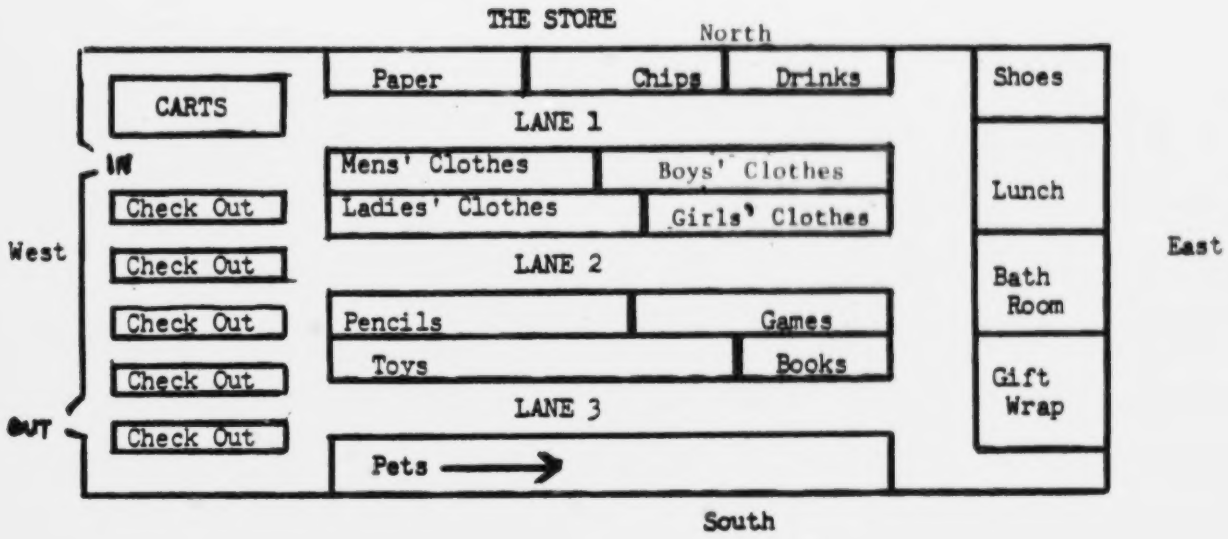
b) Find 3 other ways of getting to the school from the playground, and draw them using different colours.

c) Find the longest way to go from the playground to the school. Draw it. One is not allowed to go over the same lines twice and one must stay on the line.

d) If Jim walks 4 times around the pool, how many blocks will he walk? Each line segment is one block.

e) Miss Jones sent Sue to buy some pencils at the supermarket. How many blocks will Sue walk if she takes the shortest path to the supermarket and back to school? Draw the trip using coloured crayon.

ASSORTED PROBLEMS



What material is closest to paper, to pets, to games and to drinks?

a) Which of the following are next to each other?

_____toys & books _____pencils & books _____ shoes & gift wrap

b) Where do people enter the store?

_____on the north side _____on the west side _____on the south side

c) Which one is not in Lane 2?

_____dresses _____pencils _____hot wheels

d) In which lane will a shopper find orange pop?

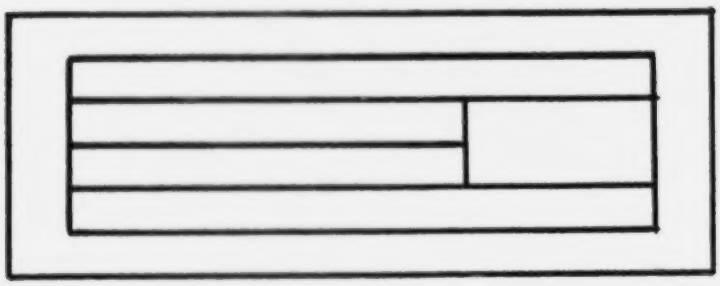
_____Lane 1 _____Lane 2 _____Lane 3

e) Which one is to the right as the shopper enters the store?

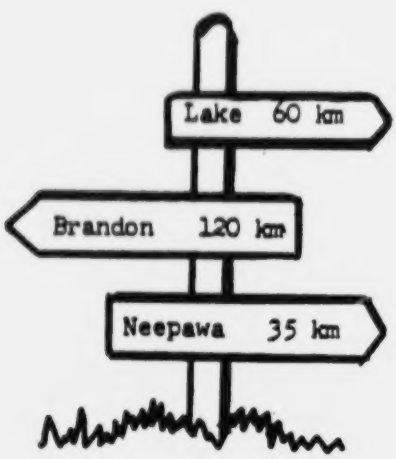
_____kittens _____writing paper _____men's shirts

ASSORTED PROBLEMS

6. The flag is made up of four different colours. Sections having the same colour do not touch. Colour the flag.



7. a) Father works in Brandon and the family is at the lake for the summer. How far is it from the lake to Brandon?



b) If Dad travels 90 km in one hour, how long will it take him to travel from Brandon to the lake?

ASSORTED PROBLEMS

8. Make as many different 2-digit numbers as possible using the numerals 3, 5, 2. What is the largest number? What is the smallest number? (Each digit may be used only once in each number.)

9. Write the largest 3 digit numbers using the numerals 2, 9, 6. Each digit may be used only once in each number.

10. a) If it takes one minute to cut through a board with a saw, how many minutes will it take to cut a board into 12 pieces?
    b) If the board was to be cut into 6 pieces, how long will it take to cut the 6 pieces?
    c) It takes one minute to make a cut with a saw. How many cuts can be made in 15 minutes? in $\frac{1}{2}$ hour? in one hour?

11. It takes 5 minutes to cut through a tree trunk. How many cuts can be made in 1 hour? Into how many pieces will the trunk be cut?

12. I am more than 2 and less than 6. When you multiply me by myself; I am 25. What am I?

13. When you add 6 to me, I am 10. When you take 2 from me, I am 2. What am I?

14. When you find how many sets of 5 are in me, I am 3. When you substract 9 from me, I am 6. What am I?

15. When you take 7 from me, I am 1. When you add 8 to me, I am 16. What am I?

ASSORTED PROBLEMS

16. If you add 6 to me I am 14. If you take half of me I am 4. What am I?

17. Which is worth more, a length of 20 cm of quarters placed side by side or a length of 30 cm of dimes placed side by side? How much money is there in each set?

18. Which is worth more, the length of your crayon in quarters placed flat and side by side or a stack of nickels the same height as the crayon? How much more?

19. A cookie and a banana split cost $1.10. The banana split costs $1.00 more than the cookie. What is the cost of the cookie and what is the cost of the banana split? Check your answer carefully.

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